Safety and Airspace Regulation Group

UK Civil Aviation Authority

Requirements for meteorological observations at aerodromes

CAP 746

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Preface

Civil Aviation Authority (CAA) Civil Aviation Publications (CAPs) are based upon national and European Union (EU) legislation and non-legislative regulatory material, such as ICAO Standards and Recommended Practices. They are published in order to provide UK industry with:

a. guidance and clarification on the means of achieving compliance with global, UK and European regulatory requirements, and where applicable:

b. details of United Kingdom (UK) 'Alternative Means of Compliance', and

c. details of any additional national requirements, including CAA administrative procedures.

Details of appropriate supporting administrative procedures are also included where necessary.

In publishing CAPs, the CAA satisfies the obligations placed upon it by the Transport Act 2000[1], Chapter 1 Article 2 'CAA's general duty', which in paragraph 2(a) requires the CAA to exercise its functions under the Act in the manner it thinks best calculated, to further the interests of operators and owners of aircraft, owners and managers of aerodromes, persons travelling in aircraft and persons with rights in property carried in them. The only interests to be considered under subsection (2)(a) are interests regarding the range, availability, continuity, cost and quality of air traffic services.

Publication of CAPs additionally satisfies the requirements set out by the Civil Aviation Authority (Chicago Convention) Directions 2007[2] to ensure that it acts consistently with the obligations placed on the UK under the Chicago Convention. The CAA is obliged to consider whether it is necessary to amend United Kingdom aviation legislation to ensure appropriate implementation of an ICAO provision.

[1] http://www.legislation.gov.uk/ukpga/2000/38/contents or http://www.legislation.gov.uk/ukpga/2000/38/data.pdf

[2] https://webarchive.nationalarchives.gov.uk/20100422174722/http://www.caa.co.uk/docs/286/CAA(ChicagoConvention)Directions2007(asamended).pdf

Where (a) the CAA considers it inappropriate to transpose an ICAO provision into domestic legislation and (b) the CAA has discretionary power to enforce the requirements of such a provision through a certificate, licence, or other means of approval, the Civil Aviation Authority (Chicago Convention) Directions 2007 obliges the CAA to shall develop and publish such requirements as are necessary to implement the ICAO provision and shall ensure that it is able to verify adherence to those requirements.

CAPs are subject to periodic revision to take account of changes to source regulatory material, feedback from industry, and recognised best practice. CAP 746 provides applicable guidance and clarification relating to the requirement for meteorological observations at aerodromes and is to be read in conjunction with the regulatory material referenced below. ***Non-inclusion of source regulatory material within this CAP does not preclude the end user from either the need to be aware of, or the need to comply with, the requirements contained within the source regulatory materials unless otherwise exempted from those requirements.***

It is the policy of the UK government that, unless a Difference (from an ICAO requirement) or 'Alternative Means of Compliance' (AltMoc) (related to an EASA 'Acceptable Means of Compliance' (AMC)) has been established, compliance with relevant international (i.e. ICAO and applicable equivalents such as International Telecommunications Union) and European regulatory material is required to the extent mandated in law. Additionally, compliance with national requirements that are not addressed by international or EU regulations is also required.

The words 'must', 'shall' and 'will' indicate that compliance with applicable regulatory requirements is necessary. In the case of AMC the word 'should' indicates that compliance is required, unless complying with an approved AltMoC.

Foreword

1. The Secretary of State for the Department for Transport (DfT) has delegated the responsibilities for the function of the UK Meteorological Authority to the Civil Aviation Authority (CAA) through the (Air Navigation) Directions 2017, in exercise of the powers conferred by Section 66(1) of the Transport Act 2000. Under the Directions, the CAA is required to develop, promulgate, monitor and enforce a policy for the sustainable use of UK airspace and for the provision of necessary supporting infrastructure for air navigation.

2. In particular, the Directions state that the CAA shall discharge the responsibilities of the UK Meteorological Authority:

   - in accordance with International Civil Aviation Organisation (ICAO), Meteorological Service for International Air Navigation, Annex 3 to the Chicago Convention and other international obligations; and
   - subject to international obligations, in such a manner as the CAA may determine from time to time.

3. The CAA has also been appointed as the UK National Supervisory Authority (NSA) under the Single European Sky Regulations and, pursuant to Article 246 of the ANO 2009, the CAA is also the National Aviation Authority (NAA) and the competent authority of the UK for the purposes of European Union Regulations[3].

4. Meteorological observations at aerodromes are provided by the aerodrome licensee for use by aviation users, operators and other providers of services to aviation.

5. Whereas ICAO is responsible for establishing aeronautical meteorological requirements, the World Meteorological Organisation (WMO) through its Commission for Aeronautical Meteorology, is responsible for specifying

[3] Under the EU (Withdrawal) Act 2018 the Government is in the process of bringing EU aviation law into UK law.

the technical methods and practices recommended for use in providing aeronautical meteorological services.

6. It is the policy of the UK Meteorological Authority that, unless a difference has been declared, meteorological services for both national and international flights are compliant with ICAO Annex 3 Standards and Recommended Practices (SARPs). Where a difference from ICAO SARPs has been declared, requirements for meteorological services will be as specified in the UK Aeronautical Information Publication (UK AIP).

7. The contact address for the UK Meteorological Authority is:

The UK Meteorological Authority
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Civil Aviation Authority
Aviation House
Beehive Ring Road
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8. CAP 746 contains procedures and information which describe the provision of meteorological observations to civil aviation in the UK, and the related regulatory requirements as specified in ICAO Annex 3 and Commission Implementing Regulation (EU) 2017/373.

9. This is a living document and will be revised at intervals to take account of changes in regulations, feedback from industry, and recognised best practice. Contact addresses, should you have any comments concerning the content of this document or wish to obtain subsequent amendments, are given on the inside cover of this publication.

Revision history

Issue 1 **4 December 2003**

- Minor editorial amendments.

Amendment 1/2004 **27 April 2004**

- Introduction of prevailing visibility.
- Enabling provision for dissemination of AUTO METAR under certain circumstances.
- Clarification of requirements for cloud ceilometer.

Amendment 1/2005 **6 October 2005**

- Revised Met Observers competency requirements.
- Introduction of term ‘no significant clouds’ (NSC) in METAR.
- Introduction of new code for AUTO METAR.

Amendment 1/2006 **31 October 2006**

- Clarification regarding when certain present weather phenomena are required to be reported.
- Clarification on how visibility should be reported in reports to air traffic.
- Guidance on how to report prevailing visibility.
- Introduction of requirements for documentation of contingency equipment.
- Introduction of requirements for recording the originator of an observation.
- Clarification on completion times for the METAR.
- Explanatory Note and Foreword unchanged but pages now numbered with Arabic instead of Roman numerals.
- Introduction of a Revision History.

Amendment 1/2007 **7 November 2007**

- Addition of e-mail address for UK Meteorological Authority.
- Changes in the definition of prevailing visibility.
- Definition of Aerodrome Reference Point.

- Requirement for observer to self-brief on the expected weather conditions prior to taking over watch.
- Changes to requirement for AUTO METARs.
- Revised Appendix C on requirement for Human Observed RVR Conversion Tables.

Amendment 1/2008 **5 November 2008**

- Changes in the reporting of CAVOK.
- Requirement for a quality system to be in place.
- Requirement for AUTO METARs to be issued when duty breaks are taken.
- Clarification of IRVR reporting requirements.
- Clarification of wind reporting requirements to ATS.
- Clarification of siting requirements for visiometers and temperature sensors.
- Clarification of requirements for visibility measuring systems.
- Update to purpose of Aerodrome Meteorological Liaison Visits.

Issue 2 **15 October 2012**

- New title for CAP 746.
- Revision to applicability of CAP 746.
- Requirement for CAT II and III aerodromes to have Integrated Met Measurement System.
- Change in the number of observations required by an observer to remain current.
- Staff carrying out Met competency checking role required to undergo refresher training every five years.
- Changes to Runway State Message format.
- Revision of sections related to AUTO METAR.
- Introduction of guidance related to calibration of wind and pressure sensors.

Issue 3 **21 May 2014**

- Minor editorial amendments.
- Clarification of Runway State Codes - R88/ and R99/.
- Runway Visual Range Special Reports, change thresholds - updated.

- Cloud Base Recorders, Visibility Measuring Systems and Present Weather Detectors are mandatory at aerodromes providing automated observations.
- Visibility Measuring Systems are mandatory at CAT II and CAT III aerodromes.
- NATS HORVR Calibration Team Contact Details - updated.
- Frequently Asked Questions - Clarification of reporting Sky Obscured, VV///.
- Clarification of Automated Cloud Coding - NCD (no clouds detected).

Issue 4 **20 March 2017**

- Minor editorial amendments
- Removal of the Gold Visibility Meter as a method for producing Human Observed RVR Conversion Tables; Copies of HORVR conversion tables are not required to be forwarded to the UK Met Authority.
- Clarification of reporting Mist.
- RETSRA, RETSSN, RETSGR, RETSGS added to the list of permitted recent weather codes
- Clarification of the requirement for records of annual observer competency assessments to be dated, and for the assessments to include a check that observers can use local backup procedures.
- Clarification of reporting SH in observations generated by automatic observing systems.
- Updates to Frequently Asked Questions.

Issue 5 **July 2020**

- Minor editorial amendments
- Changes resulting from the introduction of Commission Implementing Regulation (EU) 2017/373:
  - Reporting of RVR tendency codes in METARs;
  - Reporting of minimum and maximum RVR values in local routine and special reports;
  - Reporting the intensity of present weather in local routine and special reports;
  - Reporting of recent weather in Local Routine and Local special Reports by semi-automatic observing systems;

- Criteria for reporting variation in wind speed in METAR and local routine report.

- Guidance on achieving and maintaining Basic Meteorological Observing competency.
- Guidance on requirements for aerodromes that are not certificated as a MET Air Navigation Service Provider under the SES Common Requirements and have Instrument Approach Procedures without an Instrument Runway and/or Approach Control.

Chapter 1

Introduction

1.1 Requirements and standards for aerodrome meteorological observations, both within the United Kingdom as well as the surrounding offshore areas are determined in accordance with the standards and recommended practices (SARPs) of the International Civil Aviation Organisation (ICAO) and the guidance issued by the World Meteorological Organisation (WMO).

1.2 At licensed aerodromes, the aerodrome licensee is responsible for arranging the provision of aerodrome weather observations and other meteorological information to users.

1.3 It is recognised that this function may be performed by staff directly employed or contracted by the aerodrome licensee. In order to maintain clarity of responsibilities in respect of meteorological data, the arrangements for the compilation of aerodrome weather reports are described within this document as the responsibility of the Aerodrome Meteorological Observing Service Provider. Within the UK, the Aerodrome Meteorological Observing Service Provider is commonly the Air Traffic Service (ATS) provider organisation. This document recognises, however, that aerodrome weather reports may be produced by any suitably competent and qualified person.

1.4 At aerodromes with an Air Traffic Control unit, weather reports are provided and utilised in accordance with ICAO PANS ATM Doc 4444, and CAP 493, Manual of Air Traffic Services Part 1. At aerodromes that do not have an ATC unit, the procedures for ensuring that weather reports are made available to pilots and other users should be described locally.

1.5 All the requirements contained within this document apply to aerodromes that are certificated by the CAA under the Commission

Implementing Regulation (EU) 2017/373 as Air Navigation Service Providers and which routinely disseminate MET information beyond the aerodrome (see Chapter 1, Paragraph 1.14).

1.6 Requirements for Aerodrome Meteorological Observing Providers that are certificated by the CAA under the Commission Implementing Regulation (EU) 2017/373 as ANSPs but which do not disseminate MET information beyond the aerodorme are given below:

a) At aerodromes that **have** published or airport owned instrument approach procedures but do not routinely disseminate MET information beyond the aerodrome Meteorological ANSPs are required to ensure that all Met equipment used on the aerodrome shall meet the specifications stated in Chapter 7 and calibrated in accordance with Chapter 6, Paragraphs 6.11 to 6.17, and Appendix J, and shall ensure that staff providing MET information have and maintain Basic Meteorological Observing competency (see Appendix H).

b) At aerodromes that do **not have** published or airport owned instrument approach procedures and do not routinely disseminate MET information beyond the aerodrome, Meteorological ANSPs shall meet the specifications stated in Chapter 7, but may use less stringent requirements for pressure and wind sensors as detailed in Chapter 7, Paragraphs 7.26 and 7.50, Chapter 6, Paragraphs 6.11 to 6.17, and Appendix J, and shall ensure that staff providing MET information have and maintain Basic Meteorological Observing competency (see Appendix H).

1.7 Aerodromes that are not certificated as a MET Air Navigation Service Provider (ANSP) under Commission Implementing Regulation (EU) 2017/373 and have Instrument Approach Procedures **without** an Instrument Runway and/or Approach Control should (as a minimum) ensure that Met Equipment for wind, pressure, temperature meet the specifications stated in Chapter 6, Chapter 7 and Appendix J, but may

use less stringent requirements for pressure and wind sensors as detailed in Chapter 7, Paragraphs 7.26 and 7.50, and should ensure that staff providing MET information have and maintain Basic Meteorological Observing competency (see Appendix H).

1.8 For all other aerodromes this document should be used as guidance on best practice.

1.9 Aerodrome meteorological observations are used for flight planning purposes and to facilitate safe operation of aircraft in the take off and landing phases of flight. The information includes direction and speed of the surface wind; horizontal visibility; prevailing weather; atmospheric pressure information; surface temperature and dew point; cloud amounts and height of the cloud base. Equipment used to provide real-time information to ATC is subject to requirements specified in CAP 670 ATS Safety Requirements. If the same equipment is used to originate METAR reports and to provide real-time information to ATS, the sensing and data processing equipment will normally be subject to the requirements of the CAA UK Meteorological Authority and the display equipment used within the ATS unit will normally be subject to the relevant requirements of CAP 670 ATS Safety Requirements.

1.10 Accurate, timely and complete aerodrome meteorological observations are necessary to support safe and efficient air navigation.

1.11 Aerodrome Meteorological Observing Service Providers that are certificated under the Commission Implementing Regulation (EU) 2017/373 as an Air Navigation Service Provider are required to ensure that the unit's quality management system includes an appropriate level of detail of the meteorological processes which are applicable to the provision of meteorological services.

1.12 The quality management system should include a system that assures users that the quality of meteorological information supplied complies

with the requirements in this document. When the quality system indicates that the meteorological information does not comply with the requirements in this document it should not be issued.

1.13 The purpose of this document is to describe how ICAO standards and recommended practices and the requirements of Commission Implementing Regulation (EU) 2017/373 are applied in the UK and to specify the requirements for observers and equipment to achieve this.

1.14 The following types of aerodrome meteorological observations may be provided:

- **Official Meteorological Reports** (produced by Meteorological Service Providers certificated under Commission Implementing Regulation (EU) 2017/373 as an ANSP which, if in the form of a meteorological aerodrome report (METAR), may be disseminated beyond an aerodrome to pilots and other meteorological service providers using processes that adhere to ICAO Standards. An observer shall be accredited and competent to produce these observations, as described in Chapter 3, and, the instrumentation used shall comply with the requirements in Chapters 6 and 7.
- **Local Routine and Local Special Reports** (produced by Meteorological Service Providers certificated under Commission Implementing Regulation (EU) 2017/373 as an ANSP) that are not disseminated beyond the aerodrome. MET observers must have a Basic Meteorological Observing competency and the Met equipment used on the aerodrome shall meet the specifications stated in Chapter 7 and calibrated in accordance with Chapter 6, Paragraphs 6.11 to 6.17, and Appendix J.
- **All other meteorological observations** (not produced by certificated Meteorological Service Providers). Whilst the observer does not need to be accredited to give an opinion on the latest meteorological conditions, a basic level of meteorological competency in assessing conditions and reading instrumentation

is required. Such opinions shall be regarded as unofficial for air navigation purposes. Guidance on basic meteorological observer competency can be found in Appendix H.

1.15 METAR information is also used by Meteorological Forecast Offices in the production of Terminal Aerodrome Forecasts (TAF) and other forecasts.

1.16 The Met Observers at an aerodrome should be located, as far as possible, in a position that enables them to supply observations which are representative of the aerodrome and its vicinity.

1.17 Should an aerodrome wish to provide a Remote Aerodrome Meteorological Observing Service then the permission of the CAA is required - see CAP1620 (Remote Towers) for further details.

Chapter 2

General requirements for aerodrome observations

2.1 Timely and accurate meteorological information shall be made available to aircraft operators, ATS providers and Meteorological Forecast Offices. TAFs are provided only on receipt of valid METARs and due account should be taken by aerodrome licensees of operator requirements for these forecasts.

A METAR shall contain the following items of information:

- Identification of the type of report (e.g. METAR)
- Location indicator
- Time of Observation, in UTC
- Surface wind direction and speed (including variations in direction)
- Visibility* - see 2.2 below
- Runway visual range (where applicable and equipment/procedures have been approved)* - see 2.2 below
- Present weather* - see 2.2 below
- Cloud amount (and type, if applicable) and height of base* - see 2.2 below
- Air temperature and dew point temperature
- QNH and, where applicable QFE
- Recent Weather, when applicable
- Runway States, when applicable

2.2 Asterisked elements are included as necessary. The term CAVOK may replace visibility, present weather and cloud information under certain conditions (see glossary for definition).

2.3 Within the UK, METAR reports shall be provided every 30 minutes during the operational hours of the aerodrome.

2.4 Within the UK, local routine reports shall be disseminated at fixed intervals.

2.5 For ATS purposes, the measurements of meteorological elements should be representative of the landing and take-off areas on the runways. For the METAR, the measurement should be representative over the whole aerodrome operating area. Instrumentation used in the measurement of meteorological elements for METAR reports may also be used for reports to ATS providers, providing that the exposure of the instruments is suitable to provide representative readings for both purposes.

NOTE: Although the content of meteorological reports for ATS purposes and METAR reports are similar, the averaging periods for certain elements in the reports differ. Refer to Chapters 4 and 5 for the requirements for each type of report.

2.6 A method to ensure that observing staff are aware of, and competent in, local observing and reporting procedures shall be established.

2.7 Local observing and reporting procedures shall include the way in which observations are recorded and disseminated both within and beyond the aerodrome, including any necessary backup arrangements.

NOTE: Prior to taking over watch, observers shall obtain full information regarding the weather to be expected during the period of their watch. This may be accomplished by a study of forecasts and charts routinely supplied by the Met Office.

2.8 The observer shall continuously monitor the weather. Observations must be updated, as necessary, in a timely manner. During any period that routine METAR reports are being produced, local special reports shall be produced as dictated by the weather conditions. Unless otherwise agreed by the CAA UK Meteorological Authority, the criteria for the production of a special report shall be those given in Chapter 5, Weather Reports to Air Traffic Services. All special reports shall be issued to the ATS provider and, where possible, should be passed to the Meteorological Forecast Office.

2.9 The observer shall provide a full non-routine observation at the time of an aircraft accident on or in the vicinity of the aerodrome. This is to ensure that complete details of the weather at the time of the incident will be available to an official inquiry.

2.10 A meteorological services provider shall retain meteorological information issued for a period of at least 30 days from the date of issue (see Chapter 10, Records and Archives).

2.11 The CAA UK Meteorological Authority is responsible for arranging regulatory oversight audits of Aerodrome Meteorological Observing Units at regular intervals to ensure that a high standard of observations is maintained, that instruments and their indicators are functioning correctly, and to validate the exposure of the instrumentation. Appendix A, Purpose of aerodrome meteorological regulatory oversight audits, provides further information on such audits.

2.12 Automated sensors used to measure certain meteorological elements (typically visibility, present weather and cloud) shall be considered to be an aid to an observer rather than a direct source of information for the official weather report. Such sensors can measure each of these elements, but are limited by the spatial coverage of the sensor and the capability to resolve certain weather phenomena. Procedures shall be in place to ensure that any observation generated by a semi automatic observing system is not disseminated unless it has been checked and qualified by an accredited observer.

2.13 Where an aerodrome is closed for more than two hours (for example overnight), two consecutive METARs shall be produced before the aerodrome opens, unless otherwise agreed by the CAA UK Meteorological Authority. The METARs shall be produced by an accredited observer and separated by an interval of not less than 20 minutes and not more than 1 hour.

2.14 Aerodromes that operate 24 hours a day are required to provide METAR, or where agreed, AUTO METAR observations, at all times, and to ensure that the ATIS is updated as required.

2.15 At aerodromes where a Met observing system is installed that can be operated automatically, it may be possible for the system to generate fully automated weather reports in the form of AUTO METARs. Should an aerodrome wish to provide AUTO METARs then the permission of the CAA UK Meteorological Authority is required.

2.16 The Meteorological Forecast Office will monitor the quality of the METAR reports and provide feedback, as appropriate.

Chapter 3

Accreditation and competence of observers

Introduction

3.1 The Aerodrome Licensee is responsible for arranging provision of aerodrome weather reports and other meteorological information to users. For the purposes of this document, and to distinguish these responsibilities from other functions that are the responsibility of the Aerodrome Licensee, the responsibilities relating to meteorological information are deemed to be delegated to the Aerodrome Meteorological Observing Service Provider.

3.2 The Aerodrome Meteorological Observing Service Provider is responsible for ensuring the competence of each aerodrome meteorological observer employed at the aerodrome. This includes following initial training, during routine observing duties, following changes to observing equipment or METAR coding rules, and following the relocation of an observer from another aerodrome.

3.3 The Aerodrome Meteorological Observing Service Provider should ensure that observing staff are sufficiently familiar with all meteorological phenomena that can reasonably be expected to occur at the aerodrome as to permit their competent observation and reporting.

3.4 It is recommended that a formal agreement, such as a Service Level Agreement, be reached between the Aerodrome Meteorological Observing Service Provider and the ATS Provider and other agencies to which accurate and timely meteorological information is essential for safe operations.

The Aerodrome Meteorological Observer's certificate

3.5 In order to gain an Aerodrome Meteorological Observer (AMO) certificate, each trainee must successfully complete a recognised course of training on the preparation of aerodrome weather reports and must demonstrate basic competence in compiling such reports.

3.6 Information on recognised training courses for aerodrome observers is published and updated each year in the UK AIP, GEN 3.5. A provider wishing to utilise an alternative training organisation is advised to consult the CAA UK Meteorology Authority to ascertain the suitability of the training scheme.

3.7 The certification process comprises two parts; theory and practical. The theory part will provide the necessary background information on all elements of aerodrome meteorological observing; this is examined to ensure that the concepts have been fully understood. The practical part puts the trainee in the company of an experienced aerodrome meteorological observer in order to enable observing techniques to be practised and allows the trainee's basic competence to be assessed.

3.8 The theoretical training syllabus is given in Appendix E (Theoretical Observer Training Requirements for an AMO certificate); requirements for practical training requirements for observers are given in Appendix F (Practical Observer Training Requirements for an AMO certificate).

3.9 Following certification, the trainee observer shall continue to carry out all operational observing duties under supervision until such time that the observer can meet the competency requirements listed in Appendix I, Competency of Observers.

The Restricted Meteorological Observer's certificate

3.10 Semi-automated observing systems are utilised on many aerodromes for the provision of weather reports. Such systems process data from external sensors located at the aerodrome and compile the basic METAR report incorporating the measurements made by the sensors.

Elements such as surface wind, temperature and pressure are acceptable as measured by the sensors, without verification by an observer.

3.11 Whilst automated sensors can measure visibility, weather type, and cloud height and amount, they are limited by the spatial coverage of the sensor and the capability to resolve present weather types.

3.12 To comply with internationally agreed practices, the CAA UK Meteorological Authority requires the reporting of prevailing visibility, lowest visibility (if certain criteria are met), present weather phenomena such as thunderstorms, snow, freezing precipitation (including hail and freezing rain), towering cumulus and cumulonimbus cloud. However, the current automatic observing systems in use in the UK are either incapable of reporting these elements or do not have an appropriate high degree of accuracy and consistency. It is for this reason that measurements of horizontal visibility, present weather and cloud must be validated by an accredited observer before being issued as a METAR.

3.13 Where a semi-automated observing system is used on an aerodrome, aerodrome meteorological observers need only be competent to provide the visual elements. Reduced training may be provided, concentrating on observing visibility, weather types and cloud details.

3.14 Under these circumstances, following successful completion of the appropriate training course, a Restricted Met Observer's (RMO) certificate may be awarded. The programme for this training is given in Appendix G (Training Requirements for a Restricted Meteorological Observer's Certificate).

3.15 Contingency procedures and the provision of contingency observing equipment shall take account of the limits of the observers' accreditation. Where a semi-automated observing system is used on an aerodrome, appropriate contingency observing equipment and training shall be provided to enable a suitable level of accuracy and

regularity of observations to be maintained. Contingency observing arrangements shall be tested on a regular basis.

3.16 Restricted Met Observers should note that the RMO certificate may only be transferred to another aerodrome where a semi-automated observing system is in operation. In these cases, the Aerodrome Meteorological Observing Service Provider should ensure that the observer is provided with sufficient training to ensure that the observer can competently use the primary and backup observing system at the new aerodrome.

Continued accreditation and refresher training

3.17 The Aerodrome Meteorological Observing Service Provider shall ensure that all accredited aerodrome met observers maintain their observing competence.

3.18 Competency requirements are listed in Appendix I, Competency of Observers. The process of continuing accreditation shall be documented.

3.19 Certificated observers should carry out a minimum of fifteen observations over a consecutive period of ninety days to maintain observing and METAR coding skills; ideally, one of these observations should be during conditions when the visibility is less than 5 km, one should be during a precipitation event and one should be during 'CAVOK' conditions. Where observers do not meet the minimum requirements, the Manager, or other nominated person, of the Aerodrome Met Observing Service Provider should ensure that the observer can demonstrate observing and METAR coding competence before resuming operational observing duties.

3.20 Following changes to observing practices or aeronautical codes, the Aerodrome Meteorological Observing Service Provider shall ensure that all staff are aware of the changes, additional training arranged as necessary and that the changes are implemented accordingly.

3.21 Met Observers nominated to carry out the met observing competency checking role at an aerodrome shall ensure that they have refreshed their theoretical and practical met observing skills every 5 years by attending an approved course, thereby ensuring they are up to date with the latest coding requirements and observing techniques.

3.22 Other observing staff for instance those who have not observed for more than a year and wish to acquaint themselves with changes to observing practices and METAR codes should consider attending a met observing refresher course. Additionally staff who are unable to have their met observing competency checked locally may do so by attending such a course.

Aerodrome meteorological observing service provider contingency

3.23 The Aerodrome Meteorological Observing Service Provider shall identify contingency and other mitigation measures as agreed between the Licensee and the Provider in case of such events as observer incapacitation or equipment failure.

Non-accredited meteorological reports

3.24 A weather report that has not been produced by an accredited observer may, by agreement with the CAA UK Meteorological Authority, be distributed locally and to the meteorological forecast office. Such a report will need to be clearly identified as an unofficial report and prefixed as such when being passed to aircraft or other agency.

Chapter 4

METAR structure and UK coding rules

Introduction

4.1 In the United Kingdom the standard codes used in composing a METAR report are based on WMO Document No. 306, Manual on Codes. The full METAR message may contain up to 18 groups. The Meteorological Authority for each State determines the applicability of codes and practice to that State. The specific coding rules and practice detailed in this chapter are those applicable in the United Kingdom.

4.2 Entries for surface wind (including variations of speed and direction), surface visibility (including directional variation), present weather, cloud details, air temperature, dew point, QNH, QFE and supplementary information are normally completed. The quality of such reports shall conform to ICAO Standards and Recommended Practices (SARPs) as specified in ICAO Annex 3.

4.3 Appendix B, Frequently Asked Questions on METAR coding provides additional guidance on the compilation of the METAR.

Aviation weather report for METARs – symbolic code

Code name	**Location**	**Date/time of report**	**Automated**	**Wind velocity/gust**	**Extremes in direction**
METAR (or METAR COR)	CCCC	YYGGgg**Z**	(AUTO)	ddd**G**f_mf_m**KT**	($d_nd_nd_n$**V**$d_xd_xd_x$)
Prevailing visibility	**MNM visibility/direction**	**Runway Visual Range, RVR**	**RVR Tendency**	**Present weather**	
VVVV	($V_NV_NV_NV_ND_V$)	(**R**D_RD_R/$V_RV_RV_RV_R$)	(**R**D_RD_R/$V_RV_RV_RV_R$ U or D or N)	(w'w') (or CAVOK)	
Cloud	**Air temperature and dew point**	**QNH**	**Recent weather**	**Wind shear**	
$N_sN_sN_s$ hshshs(CC) (or NSC) (or NCD) (or **VV**$h_sh_sh_s$)	T'T' / T_d'T_d'	**Q**$P_HP_HP_HP_H$	(**RE**w'w')	(**WS** RD_RD_R) (or **WS ALL RWY**)	
Sea surface temperature and sea state	**Runway state**[4]	**Trend**	**Remarks**		
(**W**T_ST_S/**S**S) or (**W**t_ST_S/**H**$H_SH_SH_S$)	(RD_RD_R/$E_RC_Re_RE_RB_RB_R$)	(BECMG …) or (TEMPO …) or (NOSIG)			

[4] At the time of printing - see Chapter 4, Paragraph 4.133.

4.4 The table above shows the full METAR coding as given in WMO Document No. 306, Manual on Codes, Volume 1, Part A; FM15-X Ext. The UK does not use all of the codes; variations are listed below. Parentheses indicate groups to be included, as appropriate.

UK METAR coding variations

1) 'AUTO' indicates that the report has been prepared by an automated observing system, without any human input or supervision. Automatic observations shall indicate the limitations of the observing equipment through the use of additional codes, where applicable, as given in Paragraphs 4.157 to 4.170

2) Wind shear groups (WS.....) are not reported in the United Kingdom.

3) Sea surface temperature and sea state are only reported from certain UK offshore installations.

4) Not all UK METARs include a TREND forecast. A TREND forecast is a short period forecast, predicting significant weather changes that are likely to occur at the aerodrome in the two hours following the time of the meteorological observation. The TREND forecast may be appended to the METAR either by the forecaster or by the observer at aerodromes where procedures exist for obtaining the TREND message from the meteorological forecasting office.

5) 'RMK' indicates that an optional remarks section follows. The remarks section is not used in the United Kingdom by civil aerodromes.

6) A correction to a METAR shall be indicated by the use of METAR COR before the ICAO location indicator in the body of the METAR message. The time of the observation shall not be changed (unless the time of the observation requires correction).

Surface wind

Surface wind coding requirements

4.5 General format: ddd**ff**$\mathbf{G}f_mf_m\mathbf{KT}$ $d_nd_nd_n\mathbf{V}d_xd_xd_x$

Where

- ddd is the mean surface wind direction over the previous 10 minutes (but see paragraphs 4.9 and 4.12)
- ff is the mean surface wind speed over the previous 10 minutes (but see paragraph 4.9)
- f_m f_m is the maximum surface wind gust speed over the previous 10 minutes (but see paragraph 4.10)
- d_n d_n d_n and d_x d_x d_x describe the variation in surface wind speed (in clockwise order) over the previous 10 minutes (but see paragraphs 4.11 to 4.14)

4.6 Surface wind information for the METAR report should be taken from an anemometer located on the aerodrome. The anemometer should be sited in a suitable location to provide a representative measurement of conditions over the whole of the runway where there is only one runway or the whole runway complex where there are two or more. The requirements of ATS providers for surface wind information described in Chapter 5, Weather Reports to Air Traffic Services should be noted.

4.7 Where buildings or other obstructions disturb the airflow to an anemometer in certain wind directions, exceptionally a second anemometer may be used to provide surface wind information for the METAR report. Procedures for the implementation of a change in the anemometer used for the METAR should be documented.

4.8 The direction from which the surface wind is blowing shall be given in degrees from true North and the speed shall be given in knots.

4.9 The surface wind direction and speed reported is the average taken over a ten minute period immediately preceding the time of the observation. The only exception is when a marked discontinuity occurs.

This is defined as a change in the mean direction of 30 degrees or more with a mean speed of 10 knots or more before or after the change, or an increase or decrease in the wind speed of 10 knots or more, sustained for at least 2 minutes. In this case, the mean over this latter period shall be reported.

4.10 The maximum wind (gust) within the last 10 minutes (or since the marked discontinuity) shall be reported only if it exceeds the mean speed by 10 knots or more.

4.11 Variations in wind direction shall be reported only when the total variation in direction over the previous ten-minute period (or since the marked discontinuity) is 60 degrees or more or but less than 180 degrees and the average wind speed is 3 knots or more. Variations are reported in clockwise order (e.g. 290V090 or 170V250).

4.12 The mean wind direction shall not be included for variable winds when the total variation in direction over the previous ten-minute period (or since the marked discontinuity) is 60 degrees or more or but less than 180 degrees and the wind speed is less than 3 knots; the wind in this case shall be reported as variable.

4.13 The mean wind direction shall not be included for variable winds when the total variation in direction over the previous ten-minute period (or since the marked discontinuity) is 180 degrees or more or where it is not possible to report a mean direction e.g. when a thunderstorm passes over the aerodrome. The wind should be reported as variable and no reference should be made to the two extreme directions between which the wind has varied.

4.14 When the wind speed is less than 1 knot, this should be reported as calm.

4.15 It is recommended that averages of wind speed and variations in the wind direction and speed should be generated by automatic equipment.

Range and increments

4.16 The surface wind direction mean and variations in direction shall be rounded to the nearest 10 degrees in the METAR.

4.17 Wind directions of 005, 015 degrees etc. should be rounded down.

4.18 Surface wind direction is reported between 010 and 360 degrees.

4.19 The surface wind mean speed and maximum speed shall be rounded to the nearest knot in the METAR. Surface wind speed is reported between 01 and 99 knots. If the speed is 100 knots or more, the wind speed should be encoded as “P99” (see example 7 below).

4.20 Calm is encoded as ‘00000KT’.

4.21 Variable is encoded ‘VRB’.

Examples of METAR surface wind coding

1. 02008KT
   wind zero two zero degrees, 8 knots

2. 00000KT
   wind calm

3. VRB02KT
   wind variable, 2 knots (the variation in direction over the previous ten-minute period has been 60 degrees or more or but less than 180 degrees and the wind speed is less than 3 knots)

4. 33022G34KT
   wind three three zero degrees, 22 knots, max 34 knots

5. 16016KT 120V190
   wind one six zero degrees, sixteen knots, varying between 120 degrees and 190 degrees

6. 21015G28KT 180V270
   wind two one zero degrees, 15 knots, max 28 knots varying between 180 degrees and 270 degrees

7. 27070GP99KT
   wind two seven zero degrees, 70 knots, max 100 knots or more

CAVOK

Coding requirements

4.22 General format: CAVOK

4.23 The visibility, RVR, weather and cloud groups are replaced by CAVOK (Cloud And Visibility OK) when the following conditions exist simultaneously:

- Prevailing visibility is 10 km or more.
- No minimum visibility is reported.
- No cloud below 5000 ft or below the highest Minimum Sector Altitude, whichever is the greater.
- No towering cumulus or cumulonimbus clouds.
- No significant weather phenomena at or in the vicinity of the aerodrome.

4.24 Example - CAVOK should be used when the meteorological visibility is 20 km, there is no weather and there is broken cloud (5-7 oktas) at 5000 ft.

Visibility – meteorological minimum and maximum

Visibility coding requirements

4.25 General format: VVVV $V_NV_NV_NV_ND_v$

Where

- VVVV = prevailing meteorological visibility
- $V_NV_NV_NV_N$ = minimum meteorological visibility
- D_V = one or two letters indicating one of the eight points of the compass that best describes the direction of the meteorological visibility, relative to the aerodrome meteorological observer's station.

4.26 Prevailing visibility is defined as “the greatest visibility value that is reached within at least half the horizon circle or within at least half of the surface of the aerodrome. These areas could comprise contiguous or non-contiguous sectors.”

4.27 In the METAR, the visibility reported is the prevailing visibility and, under certain circumstances, the minimum visibility. In order to determine the prevailing visibility and any requirement to report the minimum visibility, the variation of visibility in all directions around the aerodrome should be considered. The requirements of ATS providers for visibility information described in Chapter 5, Local Weather Reports to Air Traffic Services should be noted.

4.28 The visibility reported in the METAR should be assessed at a height of about 1.5 m above the ground at the observing site. Observers should be aware of possible errors generated by reporting ‘slant’ visibility when meteorological visibility is assessed at heights greater than 1.5 m above the ground.

4.29 If the visibility in one direction which is not the prevailing visibility, is less than 1500 m or less than 50% of the prevailing visibility, the lowest visibility observed should be reported after the prevailing visibility and its general direction in relation to the aerodrome indicated by reference to one of the eight points of the compass. If the lowest visibility is observed in more than one direction, then the most operationally significant direction should be reported. When the visibility is fluctuating rapidly and the prevailing visibility cannot be determined, only the lowest visibility should be reported, with no indication of direction.

4.30 There is no requirement to report the lowest visibility if it is 10 km or more.

4.31 When conditions exist such that ‘CAVOK’ (defined in paragraph 4) applies, visibility shall be omitted from reports, and ‘CAVOK’ shall be reported instead. The applicability of CAVOK shall be based on the

minimum visibility, if reported in the METAR, otherwise on the prevailing visibility.

Range and increments

4.32 VVVV shall always appear in the METAR as four figures, expressed in metres when the visibility is less than 10 km (coded as '9999' when the visibility is 10 km or more).

4.33 Visibility shall be recorded in metres rounded down to:

- the nearest 50 m when the visibility is less than 800 m;
- the nearest 100 m when the visibility is 800 m or more but less than 5000 m;
- the nearest 1000 m when the visibility is 5000 m or more but less than 10 km.

4.34 Any observed value which does not fit the reporting scale in use shall be rounded down to the nearest lower step in the scale.

4.35 A visibility of less than 50 m shall be encoded as '0000';

4.36 A visibility of 50 m shall be encoded '0050';

4.37 A visibility of 10 km or more shall be encoded '9999' (unless CAVOK applies).

Examples of METAR visibility coding

1. 5000
   Prevailing visibility 5000 metres
2. 1200
   Prevailing visibility 1200 metres
3. 9999
   Prevailing visibility 10 kilometres or more
4. 0450
5. Prevailing visibility 450 metres

6. 2000 1200SE
   Prevailing visibility 2000 metres with minimum visibility 1200 metres to the southeast

7. 6000 2800S
   Prevailing visibility 6 kilometres with minimum visibility 2800 metres to the south

   i. Further guidance on assessing prevailing visibility can be found in Annex A to Appendix B.

Runway visual range

Runway visual range coding requirements

4.38 General format: **R**$D_RD_R/V_RV_RV_RV_R$

Where

- **R** is the group identifier.
- D_RD_R is the runway designator of the threshold nearest to which the RVR is measured, followed (if necessary) by L, C or R to distinguish left, centre and right parallel runways respectively.
- $V_RV_RV_RV_R$ is the RVR value reported in metres.

4.39 Runway Visual Range (RVR) is a measure of the horizontal visibility along the runway. RVR assessments are made either by human observation (HORVR) or an Instrument RVR (IRVR).

4.40 HORVR is only reported for the touchdown zone. IRVR systems may have sensors located at the touchdown zone, mid-point and stop end of each runway. However, for METAR purposes, only the touchdown zone measurement is given. If the touchdown zone value is not available then the RVR group for that runway shall be omitted.

4.41 Where there is more than one runway available for landing, the touchdown zone RVR should be included for all such runways (up to a maximum of four).

4.42 When IRVR systems are used an RVR should not be computed for a light intensity of 3 per cent or less of the maximum light intensity available on a runway. For METAR reports the RVR should be based on the maximum light intensity available on the runway.

4.43 The RVR group shall be reported in the METAR only when either the minimum visibility or the runway visual range is observed to be less than 1500 m.

NOTE: Runway visual range reports may be provided locally in other circumstances to support operational requirements.

4.44 $V_RV_RV_RV_R$ shall be inserted in the METAR after a solidus (/) and always as four figures.

4.45 50 m should be regarded as the minimum value that is possible to report. When the actual RVR is less than this, the minimum value shall be preceded by '**M**'.

4.46 2000 m should be regarded as the maximum value that it is possible to report. If the actual value is greater than can be reported by the runway visual range equipment or human observed method, the maximum value shall be preceded by '**P**'.

NOTE: The maximum value of runway visual range that can be reported for a particular runway may be significantly less than 2000 m due to equipment limitations or topography.

4.47 IRVR systems shall be sampled at a minimum of once per minute. An averaging period of 1 minute should be used for weather reports to ATS. An averaging period of 10 minutes for METAR reports should be used, however where a marked discontinuity occurs only those values after the discontinuity should be used for obtaining mean values.

NOTE: A marked discontinuity occurs when there is an abrupt and sustained change in runway visual range, lasting at least 2 minutes and which reaches or passes through the criteria for the issuance of special reports to ATS as detailed in Chapter 5 Para 5.44 and 5.45 Runway Visual Range.

RVR tendency (for IRVR systems only)

4.48 When the variation of the RVR values shows an upward or downward tendency, this should be indicated in the METAR by the abbreviation **'U'** or **'D'**, respectively. In cases when actual fluctuations during the 10-minute period show no distinct tendency, this should be indicated using the abbreviation **'N'**.

4.49 A distinct tendency is such that the mean visibility during the first 5 minutes varies by 100 m or more from the mean visibility during the second 5 minutes of the period.

4.50 When indications of tendency are not available, no abbreviations should be included.

Range and increments

4.51 $V_RV_RV_RV_R$ shall always appear in the METAR as four figures expressed in metres.

4.52 RVR is reported in metres, rounded down to:

a. the nearest 25 m for RVR below 400 m;
b. the nearest 50 m for RVR between 400 m and 800 m;
c. the nearest 100 m for RVR above 800 m.

4.53 Any observed value which does not fit the reporting scale in use shall be rounded down to the nearest lower step in the scale.

Examples of METAR RVR coding

1. R04/0075
   RVR for runway 04 is 75 m

2. R27L/0650
   RVR for runway 27 left is 650 m

3. R16R/1100
   RVR for runway 16 right is 1100 m

4. R33/M0050
RVR for runway 33 is less than 50 m (the minimum value that is possible to report)

5. R24L/P1500 R24R/1100
RVR for runway 24 left is greater than 1500 m (the maximum value that is possible to report), whilst the RVR for runway 24 right is 1100 m

6. R12/1100U
RVR for runway 12 is 1100 m and shows a distinct upward tendency in visibility in the 10 minutes preceding the observation.

Present weather

Present weather coding requirements

4.54 General format: w'w'

Where

- w'w' is the present weather

4.55 Entries of present weather shall only relate to weather occurring at the time of observation on or over the aerodrome, or, in the case of reporting phenomena in the vicinity of the aerodrome, within approximately 8 km of the Aerodrome Reference Point. Visual reference points, information from radar, pilot reports and automatic sensors may be used to assist in this determination.

4.56 If there is no weather of significance to aeronautical operations at the time of the observation, either on or in the vicinity of the aerodrome, the group is omitted. The abbreviation 'NSW' (no significant weather) is not used in the METAR.

4.57 Present weather groups consist of one or more pairs of letter abbreviations, selected from Table 1. A group shall be constructed by considering the need to specify intensity or proximity, a descriptor, and finally the phenomena, in that order.

4.58 A group may contain up to nine characters, and up to three groups may be inserted to report simultaneously occurring independent phenomena. Where two different types of weather are observed, they should be reported in two separate groups. However, different types of precipitation occurring at the time of the observation should be reported as one single group with the dominant type of precipitation reported first and preceded by only one intensity qualifier, which refers to the intensity of the total precipitation.

4.59 No definitions have been agreed internationally for intensities 'light', 'moderate', 'heavy' or 'well developed'. However, guidance on the assessment of intensity, incorporated into an explanation of the descriptors and the weather phenomena significant to aviation, is provided in paragraphs 4.74 to 4.101 below.

4.60 The intensity of weather phenomena shall only be reported if it relates to precipitation (including that qualified by freezing, shower or thunderstorm) and blowing snow. The intensity is indicated by the appropriate symbol given in Table 1.

4.61 The symbol for heavy ('+') may also be used to qualify a 'well developed' funnel cloud, water spout or dust/sand whirls.

4.62 Only certain phenomena are reported if they occur within approximately 8 km of the Aerodrome Reference Point. These are blowing dust, sand and snow, funnel cloud, waterspout, dust/sand whirls, fog, shower and thunderstorm. In all cases the intensity of the phenomenon is not reported. Also, in the case of shower in the vicinity and thunderstorm in the vicinity, the precipitation type is not specified.

4.63 The following restrictions apply to the use of the descriptors:

a. No more than one descriptor shall be included in a w'w' group.
b. The following descriptors shall only be used in combination with fog: shallow (less than 2 m above ground level), patches (fog patches randomly covering the aerodrome) and partial (a substantial part of the aerodrome covered by fog while the remainder is clear).

c. The following descriptors shall only be used in combination with dust, sand and snow: low drifting if raised by the wind to a height less than 2 m above ground level and blowing if raised by the wind to a height of 2 m or more above ground level.
d. The freezing descriptor shall be used only in combination with fog, drizzle and rain.
e. The thunderstorm descriptor may be inserted alone if thunder is heard with no precipitation.
f. The descriptors for thunderstorm and shower shall be used only in combination with rain, snow, small hail/snow pellets and hail.

4.64 The present weather codes for fog patches, fog covering a partial part of the aerodrome and fog in the vicinity of the aerodrome may be reported whatever the meteorological visibility reported.

4.65 The present weather code for fog shall be used only when the prevailing visibility is less than 1000 m in all directions from the observer's position. If this is not the case then the observer should consider the use of one of the descriptors given in paragraph 4.63.

4.66 The present weather code for freezing fog shall be used only when the prevailing visibility is less than 1000 m in all directions from the observer's position and the air temperature is less than 0°C.

4.67 The present weather code for shallow fog and mist shall be used only when the prevailing visibility reported is 1000 m or more. Observers should ensure that the reduction in visibility is due to water droplets (relative humidity should be at least 95%) and not due to smoke or haze.

4.68 The present weather codes for mist, dust, smoke and haze shall be used only when the prevailing visibility is 5000 m or less.

4.69 There are two present weather codes for hail. Hail is reported if transparent, translucent or opaque balls or pieces of ice (hailstones) are observed. Hailstones have a diameter of 5 mms or more and fall from deep cumuliform cloud. When they fall on hard ground, they

bounce with an audible sound. Small hail and/or snow pellets on the other hand have a diameter of less than 5 mms and take the form of translucent ice particles, or snow pellets encased in ice. The largest stones shall determine which element is reported and it shall be used only in combination with shower or thunderstorm.

4.70 If a mixture of precipitation types is falling at the time of the observation, they shall be encoded and combined into a single group in order of dominance, prefixed by intensity (which refers to the intensity of the total precipitation) and/or shower or thunderstorm as appropriate, e.g. '-DZRA', 'RADZ', '-SHRASN', '+TSSNRAGS'.

4.71 When more than one independent phenomenon is occurring simultaneously, separate groups shall be inserted (up to a maximum of three groups), in the order given by the columns, that is: precipitation first, then 'obscuration', and finally 'other' (e.g. '+SHGS BLSN SQ'). However, if a thunderstorm is reported, then this shall take precedence over any precipitation in the coding of present weather groups in the METAR.

4.72 When snow falling from cloud and blowing snow are observed simultaneously, both shall be included in the present weather report; e.g. 'SN BLSN'. However, if due to heavy blowing snow it cannot be ascertained that snow is falling from cloud, only '+BLSN' shall be reported.

4.73 Thunderstorm, thunderstorm in the vicinity and thunderstorm with precipitation, shall be reported as 'present weather' if thunder is heard within ten minutes preceding the observation. If lightning is seen but thunder not heard, then it is likely that the thunderstorm is not within 8 km of the Aerodrome Reference Point and should not be reported in the METAR. Observers based in buildings that contain sound-reduction materials should try to establish whether thunder is heard or if the thunderstorm is within 8 km of the Aerodrome Reference Point by any appropriate means.

Table 1: Present weather abbreviations for use in the METAR

Qualifier				Weather phenomena					
Intensity or proximity		Descriptor		Precipitation		Obscuration		Other	
1		2		3		4		5	
-	Light	**MI**	shallow	**DZ**	Drizzle	**BR**	Mist	**PO**	dust/sand whirls
		BC	patches	**RA**	Rain	**FG**	Fog	**SQ**	squalls
(no symbol)	Moderate	**PR**	partial	**SN**	Snow	**FU**	Smoke	**FC**	funnel cloud or water spout
		DR	low drifting	**SG**	snow grains	**VA**	volcanic ash	**DS**	dust storm
+	Heavy or well developed	**BL**	blowing	**PL**	ice pellets	**DU**	dust (widespread)	**SS**	sandstorm
		SH	showers	**GR**	Hail	**SA**	Sand		
VC	in the vicinity	**TS**	thunderstorm*	**GS**	small hail and/or snow pellet	**HZ**	Haze		
		FZ	freezing						

* Although TS is categorised as a descriptor it can also be used as a weather phenomenon on its own or combined with the qualifier VC. TS takes precedence in the METAR coding of present weather over any precipitation.

A guide to the descriptors and weather phenomena

Blowing (BL)

4.74 A descriptor used to indicate that dust, sand or snow has been raised by the wind to a height of 2 m or more.

Drizzle (DZ)

4.75 A fairly uniform precipitation of very fine drops of water with a diameter less than 0.5 mms, falling from thin stratiform cloud. The impact of drizzle droplets falling on a water surface is imperceptible, but continuous drizzle may produce run-off from roofs and runway surfaces. Visibility is inversely related to both the intensity of the precipitation and the number of droplets. Also generally, the heavier the drizzle, the lower the cloud base will be. Light drizzle corresponds to negligible run-off from roofs, whilst moderate drizzle, typically associated with visibility less than 3000 m, will produce some run-off. Heavy drizzle corresponds to a rate of accumulation greater than 1 mm per hour.

Dust (DU)

4.76 A widespread suspension of small particles of dust raised from the ground, reported when it reduces the prevailing visibility to 5000 m or less. Rarely reported in the UK.

Dust devil (PO)

4.77 A near vertical, rapidly rotating column of air, forming a dust and/or sand whirl as a result of very strong local convection over hot, dry ground; lifting dust, sand, grass cuttings and other light materials picked up from the surface. Dust devils are usually only a few metres in diameter and extend no higher than 200-300 ft. They can be qualified by ‘well developed’ (‘+PO’). Rarely reported in the UK.

Fog (FG)

4.78 A suspension in the air of very small water droplets (or at very low temperatures, minute ice crystals), the prevailing visibility within which

is less than 1000 m. Relative humidity will be at or near 100% (viz. dry bulb and dew point temperatures equal or very close to each other in value).

Freezing (FZ)

4.79 A descriptor used when it is necessary to indicate that the water droplets in fog, drizzle or rain are in a supercooled state (viz. liquid at a temperature below 0.0°C). On impact with the ground or an airframe, supercooled precipitation usually forms glaze (clear ice); usually, it falls from stratiform cloud. Supercooled fog may deposit rime (scales or grains of ice), but rarely clear ice.

Funnel cloud (FC)

4.80 This is a rotating column of air, often a violent whirlwind, indicated by the presence of an inverted cone-shaped cloud, extending downwards from the base of a cumulonimbus cloud, but not necessarily reaching the surface. The diameter can vary from a few metres to some hundreds of m. A funnel cloud that touches the surface is described as ‘well developed’, and known as a tornado if over ground, and a waterspout if over water. Rare but funnel clouds are reported on average on 14 days per year in the UK.

Hail (GR)

4.81 Transparent, translucent or opaque balls or pieces of ice (hailstones) with a diameter of 5 mms or more, falling from deep cumuliform cloud with vigorous updraughts within. When falling on hard ground, it bounces with an audible sound.

Small hail (GS)

4.82 As ‘hail’, but with a diameter less than 5 mms, in the form of translucent ice particles, or snow pellets encased in ice.

Haze (HZ)

4.83 Haze is caused by a widespread amount of extremely small dry particles in the air, invisible to the naked eye, but sufficiently numerous

to give the air a pale, whitish or opalescent appearance. It shall be reported when it reduces the prevailing visibility to 5000 m or less. In this case, the relative humidity will be less than 95% (and, as a guide, the difference between dry bulb and dew point temperatures is usually greater than 1°C).

Ice pellets (PL)

4.84 Frozen raindrops or re-frozen melted snowflakes falling from deep stratiform cloud, in the form of transparent or translucent ice particles, usually having a diameter of 5 mms or less, which bounce with an audible sound on impact and are not easily crushed. Ice pellets indicate that supercooled precipitation may be present at higher levels, and may occur before or after freezing rain.

Low drifting (DR)

4.85 A descriptor used to indicate that dust, sand or snow has been raised by the wind to a height of less than 2 m.

Mist (BR)

4.86 A suspension of microscopic water droplets or wet hygroscopic particles in the air. It should be reported when it reduces the prevailing visibility to between 1000m and 5000m. In this case, the relative humidity will be 95% or more (and, as a guide, the difference between dry bulb and dew point temperatures is usually 1°C or less).

Partial (PR)

4.87 A descriptor used only in combination with ‘FG’ to indicate that fog, 2 m or more deep, covers a substantial part of the aerodrome, while the remainder is clear (e.g. a bank some hundreds of metres across). The meteorological visibility reported will depend on the proximity of the edge of the fog bank to the observer.

Patches (BC)

4.88 A descriptor used only in combination with ‘FG’ to indicate that fog, 2 m or more deep, is present on the aerodrome in irregularly distributed

patches. The meteorological visibility reported will depend on the proximity of the nearest fog patch to the observer.

Rain (RA)

4.89 A precipitation of liquid water droplets with a diameter of 0.5 mms or more, falling from cloud. Diameter and concentration of the drops may vary considerably according to the intensity of the precipitation, its nature and source (viz. light, moderate or heavy; intermittent or continuous). If the precipitation falls from cumuliform cloud, then it is further described as a shower (see paragraph 4.92). There is no internationally agreed scale for intensity, but the following, based on rate of fall, is used in the United Kingdom:

From stratiform cloud
Light: up to 0.5 mm/hr; Moderate: >0.5 to 4 mm/hr; Heavy: over 4 mm/hr.

From cumuliform cloud
Light: up to 2 mm/hr; Moderate: >2 to 10 mm/hr; Heavy: over 10 mm/hr.

NOTE: As a guide to observers, light rain is precipitation of low intensity; it may consist of scattered large drops or more numerous smaller drops. The rate of accumulation on the ground is such that puddles form only slowly, if at all. Moderate rain falls fast enough to form puddles rapidly, to make down-pipes flow freely, and to give some spray on hard surfaces. Heavy rain is a downpour, which makes a roaring noise on roofs, forms a misty spray on road surfaces etc. In the UK, light rain makes up on average 80% of the total rainfall, moderate 15% and heavy only 5%.

Sand (SA)

4.90 In the United Kingdom, this typically would be used only in combination with ‘BL’ or ‘DR’, to report particles of sand lifted off the ground by the wind.

Shallow (MI)

4.91 A descriptor used only in combination with ‘FG’ when ground fog, whether patchy or a continuous layer, is less than 2 m deep, and hence the reported meteorological visibility will be 1000 m or more.

Operationally shallow fog may cause problems by obscuring runway markings and lights.

Shower (SH)

4.92 A descriptor used to identify precipitation (rain, snow, hail, snow pellets) falling from cumuliform clouds. Showers are often short-lived, and can be characterised by their sudden beginning and ending, and by large and rapid changes in precipitation intensity.

Small hail (GS)

See ‘Hail’.

Smoke (FU)

4.93 A suspension in the air of small particles produced by combustion, frequently imparting a grey or blue hue to the atmosphere. It should be reported when it reduces the prevailing visibility to 5000 m or less; it may even be reported when the prevailing visibility is less than 1000 m if there are no suspended water droplets, and the relative humidity is not higher than 90%.

Snow (SN)

4.94 A solid precipitation of aggregated ice crystals falling from cloud as snowflakes. The shape, size and concentration of snowflakes vary considerably according to the temperature at which they form and the conditions in which they develop. At very low temperatures, snowflakes are small and often show a six-rayed starlike structure. Near to freezing point, they are agglomerated, and may have a diameter greater than 25 mms.

4.95 In the absence of an internationally agreed scale, intensity (from both stratiform and cumiliform clouds) is assessed from the rate of accumulation:

Light: up to 0.5 cm/hr
Moderate: more than 0.5 to 4 cm/hr
Heavy: over 4 cm/hr

4.96 As a guide to observers, snow can be regarded as light when the snowflakes are sparse and usually small. Snow is moderate when the snowfall consists of usually large flakes falling sufficiently thickly to impair visibility substantially. Heavy snow causes visibility to be reduced to a very low value, often 'white-out' conditions.

Snow grains (SG)

4.97 Very small opaque white particles of ice, fairly flat or elongated with a diameter generally less than 1 mm, that fall from a layer cloud – the frozen equivalent of drizzle.

Snow pellets (GS)

4.98 White, opaque, approximately round ice particles falling from cumuliform cloud, often together with snow, at temperatures near 0.0oC, and usually having a diameter of 2 to 5 mms, resembling tiny compacted snow balls. They rebound when falling on a hard surface, and are crisp and easily crushed. Snow pellets result from hail being blown out of the side or top of cumulonimbus before the manufacturing process is complete (see also 'Small hail').

Squall (SQ)

4.99 A strong wind that rises suddenly: that is by at least 16 knots, increasing to 22 knots or more, and sustained for at least one minute, then dying away quickly; distinguished from a gust by its longer duration. A squall is associated with violent convective activity and the passage of active cold fronts. In the latter case, typically squalls occur along the line of the front, accompanied by a veer in wind, a sharp fall in temperature, a rise in relative humidity and the appearance of a roll-shaped cloud with a horizontal axis.

Thunderstorm (TS)

4.100 One or more sudden electrical discharges, manifested by a flash of light (lightning) and a sharp crack or rumbling sound (thunder). Thunderstorms are associated with cumulonimbus clouds. When thunder is heard with no precipitation falling on the aerodrome, 'TS'

alone is reported in the METAR, or 'VCTS' if the source is estimated to be within 8 km of the Aerodrome Reference Point. To report a thunderstorm with precipitation at the aerodrome, 'TS' is used as a descriptor, and combined with the appropriate precipitation abbreviations and prefixed (where necessary) by an intensity symbol based on the rate of fall of the precipitation.

Tornado

See 'Funnel cloud'.

Volcanic ash (VA)

4.101 A suspension or precipitation of dust or solid particles in the atmosphere, known to be originating from an active volcano.

Waterspout (FC)

See 'Funnel cloud'.

Summary of present weather codes

Table 2: Present weather codes

Present weather reported with intensity*	Present weather reported without intensity	Present weather that may be reported to be within 8 km of the aerodrome reference point
- or **+**		**VC**
DZ or **RA** or **SN** or **SG** or **PL** or **DS** or **SS** or **TS** or **TSRA** or **TSSN** or **TSPL** or **TSGR** or **TSGS** or **SHRA** or **SHSN** or **SHGR** or **SHGS** or **FZRA** or **FZDZ** or **BLSN** or **BLSA** or **BLDU**	**FG** or **BR** or **SA** or **DU** or **HZ** or **FU** or **VA** or **SQ** or **FZFG** or **DRSN** or **DRSA** or **DRDU** or **MIFG** or **BCFG** or **PRFG**	**FG** or **PO** or **FC** or **DS** or **SS** or **TS** or **SH** or **BLSN** or **BLSA** or **BLDU**
PO or **FC**		

*

NOTE 1: No qualifier used for moderate intensity.

NOTE 2: Funnel cloud, water spout or dust/sand whirls only to be reported as PO, FC, +PO or +FC.

NOTE 3: A present weather entry may contain up to nine characters and up to three groups may be used to report simultaneously occurring phenomena.

Cloud

Coding requirements

4.102 General format: $N_sN_sN_sh_sh_sh_s$(CC) or NSC or NCD or **VV**$h_sh_sh_s$

Where

$N_sN_sN_s$ is the cloud amount expressed as either FEW, SCT, BKN, OVC.
$h_sh_sh_s$ is the height of the cloud base in 100s of ft above aerodrome.
(CC) is the cloud type where applicable, only cumulonimbus (CB) and/or towering cumulus (TCU) are coded in the METAR.
NSC represents no significant clouds i.e. no cloud below 5000 ft or below the minimum sector altitude (whichever is the greater) and no towering cumulus or cumulonimbus (TCU or CB).
NCD is not used by human observers. It represents no clouds detected and is ONLY reported by automatic observing systems to indicate that no clouds are detected by the system.
VV$h_sh_sh_s$ is the vertical visibility height. VV/// indicates that vertical visibility height is not measured, or sky obscured.

4.103 Normally up to three cloud layers may be reported (although in certain circumstances more can be reported - see (d) below):

a. the lowest layer, whatever the amount;
b. the next layer above of amount 3 oktas or more (SCT, BKN or OVC);
c. the next layer above of amount 5 oktas or more (BKN or OVC);
d. insert any towering cumulus or cumulonimbus cloud omitted by the above rules, whilst retaining base height order from lowest to highest.

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Range and increments

4.104 The cloud amount (NsNsNs) can be expressed as:

a. FEW - no more than quarter cover (1-2 oktas)
b. SCT - over ¼ but no more than ½ cover (3-4 oktas)
c. BKN - over half but not complete cover (5-7 oktas)
d. OVC - complete cover (8 oktas)

4.105 The height of the cloud base (hshshs) is reported in hundreds of ft above aerodrome level.

4.106 Where there is no cloud below 5000 ft or below the highest minimum sector altitude (whichever is greater) and there is no towering cumulus or cumulonimbus, ‘NSC’ (no significant clouds) is reported.

4.107 The cloud type is usually not specified. However, significant convective cloud, indicated by ‘TCU’ (Towering Cumulus), defined as ‘cumulus with strong vertical development’, and ‘CB’ (Cumulonimbus), shall be inserted (without a space) after the height of the cloud base. The amount, height of cloud base and cloud type of towering cumulus or cumulonimbus shall be reported, irrespective of the cloud base height.

4.108 When concurrent TCU and CB cloud masses appear to have a common base, the amount shall be encoded from the sum of the individual amounts, and the type reported as cumulonimbus.

4.109 The height of the cloud base is rounded down to the nearest hundred ft up to 10000 ft and to 1000 ft thereafter. A base height of less than 100 ft above the aerodrome is encoded ‘000’.

4.110 When the term CAVOK applies (see paragraphs 4.22 to 4.24), ‘CAVOK’ is reported in lieu of cloud information.

4.111 When the sky is obscured due to fog, falling or blowing snow, ‘VV///’ is reported in lieu of cloud information. Note that in the UK, vertical visibility is not assessed.

4.112 When ‘TS’ (thunderstorm) is reported as present weather, ‘CB’ (cumulonimbus) shall be reported.

Examples of METAR cloud coding

7. FEW010 SCT022 BKN045
1-2 oktas of cloud base 1000 ft above aerodrome level, 3-4 oktas of cloud base 2200 ft above aerodrome level and 5-7 oktas of cloud base 4500 ft.

8. FEW008 BKN013TCU
1-2 oktas of cloud base 800 ft above aerodrome level, 5-7 oktas of towering cumulus cloud base 1300 ft above aerodrome level.

9. SCT055CB
3-4 oktas of cumulonimbus cloud base 5500 ft above aerodrome level.

10. NSC
No cloud below 5000 ft and no towering cumulus or cumulus observed at any level (but CAVOK conditions do not exist).

Air temperature and dew point

Coding requirements

4.113 General format: T’T’ / T’$_d$T$_d$

Where

T’T’ = the dry bulb temperature to the nearest whole ˚C.
T’$_d$’T’$_d$ = the dew point temperature to the nearest whole ˚C.

4.114 Two temperatures are given in the METAR; the outside air temperature and the dew point. The dew point is not measured directly from a thermometer; however it can be calculated from the dry bulb and wet bulb temperatures or the relative humidity.

4.115 When the wet-bulb is frozen, the ice-bulb temperature is used to compute dew point.

Range and increments

4.116 The dry bulb and dew point temperatures are reported to the nearest whole degree Celsius (°C). A two-digit figure for each temperature is given, preceded by 'M' if a temperature is negative.

4.117 When the temperature value is a 0.5 reading, the value is reported to the warmer temperature. Therefore 3.5°C is rounded up to 4°C and minus 3.5°C is rounded up to minus 3°C.

4.118 A temperature or dew point between minus 0.5°C and minus 0.1°C is encoded as 'M00', whilst a temperature or dew point between 0.0°C and plus 0.4°C is encoded as '00'.

4.119 Exceptionally, if a dew point temperature is unavailable, it is replaced by additional solidii (//).

Examples of METAR temperature and dew point coding

1. The coding 05/M00 is valid for a dry-bulb reading of plus 4.5°C to plus 5.4°C and dew point between minus 0.5°C and minus 0.1°C.

2. A dry-bulb temperature of plus 0.4°C and a dew point calculated to be minus 3.7°C would be encoded 00/M04.

3. A dry-bulb temperature of plus 6.5°C but the humidity sensor is unserviceable would be encoded 07///.

Atmospheric pressure

Coding requirements

4.120 General format: **Q**$P_HP_HP_HP_H$

Where

Q is the group identifier

$P_HP_HP_HP_H$ is the atmospheric pressure, corrected to mean sea level (QNH)

4.121 Atmospheric pressure is used by aircraft altimeters and for this reason it is important to provide accurate pressure measurements.

4.122 The QNH is the atmospheric pressure corrected to mean sea level (based on International Standard Atmosphere conditions throughout the height difference) and is reported in the METAR rounded down to the nearest whole hectopascal.

4.123 The SI unit of pressure is the Pascal; for reference the millibar is equivalent to 10000 Pascals or 1 hectopascal).

Range and increments

4.124 The pressure is inserted in the METAR rounded down to the nearest whole hectopascal, prefixed by indicator letter '**Q**'.

4.125 Pressure settings, such as QNH and QFE, are normally integer values. Pressure settings should be available to an accuracy of one tenth of a hectopascal on request.

4.126 If the value is less than 1000 hectopascals, a zero shall be inserted following '**Q**'.

Examples of METAR pressure coding

1. Q0987
   Pressure reduced to mean sea level is 987 hectopascals.

2. Q1001
   Pressure reduced to mean sea level is 1001 hectopascals.

3. Q0999
   Pressure reduced to mean sea level is 999 hectopascals.

4. Q1023
   Pressure reduced to mean sea level is 1023 hectopascals.

Recent weather

Coding requirements

4.127 General format: **RE**W'W'

Where w'w' is the abbreviation for recent weather groups; always preceded by RE.

4.128 Recent weather is defined as the weather that has ceased or decreased in intensity since the last routine report or within the last hour, whichever is the shorter. In the METAR, it is reported after the QNH.

4.129 Recent weather should be encoded and inserted in the METAR if, during the period since the last routine report or in the last hour (whichever is the shorter), one or more of the phenomena listed below was observed at the station and has since ceased or is still on-going, but decreased in intensity.

1. Freezing precipitation of any intensity.
2. Moderate or heavy precipitation: drizzle, rain, snow, ice pellets, snow pellets, hail (any diameter).
3. blowing snow.
4. Funnel cloud (tornado, waterspout); volcanic ash.
5. Thunderstorm

Up to three recent weather groups may be reported. Each group is formed using the appropriate present weather two-letter abbreviations prefixed by the indicator letters 'RE'. The full list of permitted recent weather codes are detailed in the 'Summary of recent weather codes' table - see below.

4.130 Not all recent weather is regarded as operationally significant.

4.131 A recent weather group is not inserted if the same phenomenon of a similar or greater intensity is reported as present weather.

4.132 Intensity qualifiers are not used when reporting recent weather.

Examples of METAR recent weather coding

1. If light drizzle, rain, snow, ice pellets, small hail and/or snow pellets, hail or blowing snow, either individually or in combination, have ceased since the last report, no recent weather group is inserted.

2. If a moderate snow pellet shower occurred since the last report, but then became a heavy shower of snow and rain:

   - Present weather reported is +SHSNRA and recent weather is RESHGS.

3. If snow is currently moderate but has been occasionally heavy since the last report:

   - Present weather reported is SN and recent weather is also RESN.

4. If moderate rain has ceased since the last report, but a moderate rain shower is falling at the time of the observation:

   - Present weather reported is SHRA and recent weather is RERA.

5. If a thunderstorm with moderate or heavy rain has occurred since the last report, but both have ceased:

   - No present weather is reported and recent weather is RETSRA.

Summary of recent weather codes

Thunderstorm	**RETS**
Thunderstorm and moderate or heavy rain	**RETSRA**
Thunderstorm and moderate or heavy snow	**RETSSN**
Thunderstorm and moderate or heavy hail	**RETSGR**
Thunderstorm and moderate or heavy snow pellets	**RETSGS**
Freezing rain	**REFZRA**
Freezing drizzle	**REFZDZ**
Moderate or heavy rain	**RERA**

Moderate or heavy snow	**RESN**
Moderate or heavy drizzle	**REDZ**
Moderate or heavy ice pellets	**REPL**
Moderate or heavy snow grains	**RESG**
Moderate or heavy showers of rain	**RESHRA**
Moderate or heavy showers of snow	**RESHSN**
Moderate or heavy shower of small hail / snow pellets	**RESHGS**
Moderate or heavy showers of hail	**RESHGR**
Moderate or heavy blowing snow	**REBLSN**
Unidentified precipitation	**REUP**
Moderate or heavy shower of unidentified precipitation	**RESHUP**
Unidentified frozen precipitation	**REFZUP**
Thunderstorm with unidentified precipitation	**RETSUP**
Sandstorm	**RESS**
Dust storm	**REDS**
Funnel cloud	**REFC**
Volcanic ash	**REVA**

Runway states

4.133 Amendment 77-B to ICAO Annex 3 (Effective from 0001 UTC on 5 November 2020) introduced a new system of reporting runway contamination called the ICAO Global Reporting Format (GRF). The implication of the new GRF to MET Service Provision is that the current requirement to include supplementary information regarding the state of the runway in METAR was due to be removed with effect from 5 November 2020.

However, at the time of printing the ICAO Council has issued a decision notifying that the effective date for the implementation of the GRF has been deferred until 4th November 2021 and therefore runway states should **continue** to be reported in METARs until that date (and plans developed to cease reporting the state of the runway in METARs from this date).

4.134 For further information regarding the Global Reporting Format aerodromes should refer to the CAA website and/or liaise with their CAA Aerodrome Inspector.

Coding requirements

4.135 General format: $RD_RD_R/E_RC_Re_Re_RB_RB_R$

Where RD_RD_R is the runway designator (RD_RD_R(L), RD_RD_R(C), RD_RD_R(R)), where D_RD_R is the runway direction in use and the L,C,R refer to left, centre and right respectively. After the runway designator a slash (/) should be inserted.
E_R is the runway deposits designator.
C_R is the extent of runway contamination.
e_Re_R is the depth of deposit.
B_RB_R is the friction coefficient/ braking action.

4.136 If a runway inspection is not possible, it is preferable to report changes by general assessment rather than let a clearly unrepresentative message be repeated, for example, when:

a. snow is judged to be turning to slush; or
b. it is apparent that snow depth has increased/decreased.

4.137 Appropriate local arrangements should be in place to ensure that a runway state message is available to the observer in good time for insertion into the next METAR.

4.138 The use of the braking action / friction coefficient coding 99 which indicates figures unreliable should not be used to indicate a missing value.

4.139 Within the UK, friction co-efficient measurements are only made on runways contaminated by ice (gritted or un-gritted) and compacted snow. Where contamination is caused by water, slush or wet snow then the friction coefficient or braking action should be reported as //.

4.140 The use of the coding 99 which indicates figures unreliable should not be used to indicate a missing value.

4.141 A full decode of the runway state group is reproduced in Table 3.

4.142 The depth of the deposit reported should be the average of the readings for the usable length of the runway.

4.143 Should the extent of contamination be provided as values for the Touchdown, Midpoint and End, the extent of contamination should be reported as the worst value. i.e. if report indicates Touchdown 10%, Midpoint 10%, End 20% then the Runway State would be coded as 2 = 11%- 25%.

4.144 If a runway is being cleared of ice, snow, slush, etc. and a Runway State cannot be provided, as the runway(s) is non-operational due to runway clearance in progress the Runway State shall be reported as follows: RD_RD_R///99//. E.g. R14///99//.

4.145 If contamination conditions on a single runway or on all runways at an aerodrome have ceased to exist, the following should be reported as follows: RD_RD_R/CLRD//. E.g R14/CLRD//. At airports that operate more than one runway the code R88/CLRD// should be issued once the contamination has been cleared from all runways.

4.146 SNOCLO shall be reported at all times when the aerodrome is closed due to contaminated runway(s). It is coded as R/SNOCLO.

4.147 As it is impractical for the Runway State to be updated when an AUTO METAR is being provided, no Runway State should be appended to an AUTO METAR.

Examples of runway state coding for METAR

1. R14/4215//
   Runway 14 has 11%-25% contamination of 15 mms of dry snow, no braking action is provided.

2. R99/6101//
   This is a repetition of the last message because no new information has been provided. The runway has 10% or less of slush to a depth of 1 mm, no braking action is provided.

3. R27/759291
   Runway 27 is contaminated by 10 centimetres of ice, covering 26%-50% of the runway. A runway braking action of poor has been issued.

4. R14///99//
   Runway 14 is non operational due to runway clearance in progress.

5. R/SNOCLO
   The aerodrome is closed due to contamination of the runways.

6. R14/CLRD//
   Contamination has ceased to exist on Runway 14.

Table 3: Runway state group coding for use in the METAR

RDRDR	**Runway designator**
R22/	Runway R22
R27R/	Runway 27 right
R88/	All runways
R99/	A repetition of the last message because no new information received
E_R	**Runway deposits**
0 =	Clear & dry
1 =	Damp
2 =	Wet or water patches
3 =	Rime or frost covered (depth normally less than 1 mm)
4 =	Dry snow
5 =	Wet snow
6 =	Slush
7 =	Ice
8 =	Compacted or rolled snow
9 =	Frozen ruts or ridges
/ =	Type of deposit not reported (e.g. due to runway clearance in progress)
C_R	**Extent of contamination**
1 =	10% or less
2 =	11% to 25%
5 =	26% to 50%
9 =	51% to 100%
/ =	Not reported due to runway clearance in progress
e_re_r	**Depth of deposit**
00 =	< 1 mm
01 =	1 mm etc. thru' to
90 =	90 mm
91 =	not used

92 =	10 cm
93 =	15 cm
94 =	20 cm
95 =	25 cm
96 =	30 cm
97 =	35 cm
98 =	40 cm or more
99 =	Runways non operational due to snow, slush, ice, large drifts or runway clearance but depth is not reported
// =	Depth of deposit operationally not significant or not measurable
B_RB_R	**Friction coefficient / Braking action**
28 =	Friction coefficient 28%
35 =	Friction coefficient 25% or
91 =	Braking action poor
92 =	Braking action medium/poor
93 =	Braking action medium
94 =	Braking action medium/good
95 =	Braking action good
99 =	Figures unreliable
// =	Friction coefficient / Braking action not reported
SNOCLO	When the aerodrome is closed due to contamination of runway(s) it is reported as R/SNOCLO
CLRD	If contamination ceases to exist, the code CLRD is used and reported as RD_RD_R/CLRD// e.g. R14/CLRD//

TREND forecast

4.148 General format: NOSIG or BECMG [change group] or TEMPO [change group]

4.149 Time indicators and periods are used to give additional meaning to the above change descriptors as described in Table 4:

Table 4: Time indicators and periods used with change descriptors

Change indicator	Time indicator and period	Meaning	
NOSIG		no significant changes are forecast	
BECMG	FM$n_1n_1n_1n_1$ TL$n_2n_2n_2n_2$	the change is forecast to…	commence at $n_1n_1n_1n_1$ and be completed by $n_2n_2n_2n_2$
	TLnnnn		commence at the beginning of the TREND forecast period and be completed by nnnn
	FMnnnn		commence at nnnn and be completed by the end of the TREND forecast period
	Atnnnn		occur at nnnn (specified time)
	-		commence at the beginning of the TREND forecast period and be completed by the end of the TREND forecast period
TEMPO	FM$n_1n_1n_1n_1$ TL$n_2n_2n_2n_2$	temporary fluctuations are forecast to…	commence at $n_1n_1n_1n_1$ and cease by $n_2n_2n_2n_2$
	TLnnnn		commence at the beginning of the TREND forecast period and cease by nnnn
	FMnnnn		commence at nnnn and cease by the end of the TREND forecast period
	-		continue throughout the TREND forecast period

4.150 All times quoted are UTC.

4.151 Forecasts of changes in the following elements may be included in the TREND forecast if change criteria (published in the UKAIP GEN 3.5.) are expected to be crossed; wind, visibility, present weather and cloud.

Range and increments

4.152 Wind: All ranges given in paragraphs 4.16 to 4.21 may be used.

4.153 Prevailing visibility: Only one value (the prevailing visibility, as defined in paragraph 4.26) will be forecast. All ranges given in paragraphs 4.32 to 4.37 may be used, including CAVOK if applicable.

4.154 Present weather: All codes given in the first two columns of Table 2 shown earlier in this chapter may be used, including changes to

intensity where applicable. Note that weather forecast to be in the vicinity of the aerodrome is not included in the TREND forecast, only that which is expected to affect the aerodrome. In addition, if certain present weather is occurring in the observation and is expected to cease during the TREND forecast period, the letters 'NSW' (no significant weather) may be used in the TREND forecast to indicate this.

4.155 Cloud: All ranges given in paragraphs 4.104 to 4.112 of this chapter may be used.

4.156 TREND forecasts have certain expected tolerances of accuracy and individual elements of the forecast may vary within these limits. Further information can be found in the UK AIP GEN 3.5.

Examples of METAR TREND forecast coding

a. TEMPO 25035G50KT
Temporary fluctuations in the wind to 250 degrees True, ten-minute mean speed 35 knots with maximum speed (gusts) 50 knots.

b. BECMG 0500 SN VV///
Conditions are expected to become 500 m in moderate snow and sky obscured. No timescale is stated, so it must be expected that the change will commence at the beginning of the TREND forecast period and be completed by the end (i.e. within 2 hours)

c. BECMG AT 1800 9000 NSW
Conditions are expected to become 9000 m and present weather (reported in the METAR) will cease. This is expected to happen at 1800 UTC.

AUTO METAR

4.157 AUTO METARs are reports that have been prepared by an automated observing system without any human input or supervision. The

automatic observing system must be located on the aerodrome concerned and it shall routinely provide the following information:

- Wind speed and direction;
- Visibility;
- Cloud amount and height;
- Temperature and dewpoint;
- Pressure, and
- Present weather.

4.158 When the aerodrome is operational the following additional information shall also be provided automatically when required:

- RVR;
- Thunderstorm and Thunderstorm in the vicinity;
- Cumulonimbus clouds;
- Towering cumulus clouds

4.159 Aerodromes that provide AUTO METARs during the Met Observers overnight duty break are not required to provide information on thunderstorm and cloud type.

4.160 Information on thunderstorm, thunderstorm in the vicinity and cloud type may be included using data processed from remote sensing instrumentation.

- Where the observation is generated by an automatic observing system without any human input or supervision, the code 'AUTO' shall be inserted between the date/time of the report group and the wind group.

Automated cloud reports

4.161 Where the observation is generated by an automatic observing system which is not operating then the report will consist of 6 slashes (//////).

4.162 Where the observation is generated by an automatic observing system and is unable to detect towering cumulus or cumulonimbus this shall be indicated by three slashes (///) after each cloud group of cloud amount and height.

4.163 Where the observation is generated by an automatic observing system the letters NCD (No Clouds Detected) shall be used to indicate that the observing system has determined that there are no clouds below 5000 ft present.

4.164 When towering cumulus cloud(s) are detected by automated means, but no information on its height or cloud amount is available. Then the following code shall be given after the cloud amount and height information //////TCU.

4.165 When cumulonimbus cloud(s) are detected by automated means, but no information on its height or cloud amount is available. Then the following code shall be given after the cloud amount and height information //////CB.

Automated visibility reports

4.166 Where the observation is generated by an automatic observing system which is not providing visibility information then the report will consist of 4 slashes (////).

Automated present weather reports

4.167 The following present weather phenomena and their intensity, as a minimum, are required to be provided by automated systems:

- rain;
- drizzle;
- snow;
- rain and snow;
- freezing rain;

- freezing drizzle;
- fog;
- freezing fog;
- mist;
- haze.

4.168 Where the observation is generated by an automatic observing system and showers cannot be determined based upon a method that takes account of convective cloud, precipitation should not be characterised by SH.

4.169 Where the observation is generated by an automatic observing system and the present weather cannot be detected due to unserviceable present weather sensors, the lack of present weather information should be indicated by two slashes (//). If the present weather sensor is serviceable but not detecting any present weather then no present weather group should be reported.

4.170 If the present weather sensor is unable to determine the state or form of the precipitation ‘UP’ (unidentified precipitation) or ‘FZUP’ (freezing unidentified precipitation), together with intensity qualifications, should be reported as appropriate. Recent unidentified precipitation (‘REUP’ and ‘RETSUP’ or ‘REFZUP’) shall be reported if moderate or heavy unidentified precipitation has ceased or decreased in intensity since being reported the last routine report or within the last hour, whichever is the shorter.

Examples of AUTO METAR coding:

1. METAR EGZZ 282220Z AUTO 29010KT 6000 FEW010/// BKN025/// 17/12 Q0996=
2. METAR EGZZ 290450Z AUTO VRB02KT 3000 BR NCD 10/09 Q1002=
3. METAR EGZZ 301150Z AUTO 18025G35KT 8000 TSRA FEW010/// SCT028/// //////CB 18/15 Q1009=

Chapter 5

Local weather reports to air traffic services

Introduction

5.1 Local routine weather reports to Air Traffic Services are issued half-hourly and are used by the ATS unit to provide weather information to operators, aerodrome users and pilots at or in the vicinity of the aerodrome. Whilst these reports are very similar to the METAR, there are slight differences in content and coding; these are highlighted below. Further information can also be found in CAP 493 Manual of Air Traffic Services, Part 1.

5.2 During any period that weather reports are being provided to ATS, local special reports also shall be produced and made available to pilots, operators and other aerodrome users, if conditions warrant. Unless otherwise agreed with the CAA UK Meteorological Authority, or if applicable, by local arrangement with aerodrome users, the criteria for the production of a special report shall be those given in paragraphs 5.35 to 5.51 of this chapter.

5.3 By agreement between the Aerodrome Meteorological Observation Service Provider and ATS Provider, the format of weather observations provided to ATS may be varied (e.g. the report may be provided in the METAR code).

5.4 Dynamic meteorological information may be provided by ATS units to aircraft for take-off and landing. Equipment used to provide dynamic meteorological information to ATS is subject to requirements specified in CAP 670 ATS Safety Requirements.

5.5 Weather reports to ATS may be provided from automated systems without any human input or supervision when an aerodrome is non operational. Permission from the CAA UK Meteorological Authority is

required to enable the use of automated local routine and special weather reports when used during operational hours of an aerodrome. Where information is used from automated systems to compile ATIS reports then this shall be indicated on the transmission.

Surface wind

5.6 The surface wind information provided should be representative of the conditions along the runway. Since, in practice, the surface wind cannot be measured directly on the runway, surface wind observations for take-off and landing should be sited to give the best practicable indication of conditions along the runway, e.g. lift-off and touchdown zones.

5.7 In reports to aircraft for take-off and landing, direction is to be expressed in degrees Magnetic, and the reading is averaged over the previous 2 minutes; in addition, the extremes in direction and speed (gust and lull) during the past 10 minutes shall be provided. The instantaneous surface wind should be available to give to pilots on request. Further information can be found in CAP 670 ATS Safety Requirements.

5.8 As well as 2-minute mean wind speeds, maximum (gust) and minimum (lull) wind speeds shall be provided when the difference is 10 knots or more from the 2-minute mean wind speed.

5.9 Variations in wind direction shall be reported when the total variation in direction over the previous ten-minute period is 60 degrees or more and the wind speed is 3 knots or more. Variations are reported in clockwise order (e.g. 290V090 or 170V250).

5.10 The mean wind direction shall not be included for variable winds when the total variation in direction over the previous ten-minute period is 60 degrees or more or but less than 180 degrees and the wind speed is less than 3 knots; the wind in this case shall be reported as variable; however the two extreme directions between which the wind has varied

should be included. When a wind speed of less than 1 knot is observed it should be reported as calm.

5.11 The mean wind direction shall not be indicated for variable winds when the total variation in direction over the previous ten-minute period is 180 degrees or more or where it is not possible to report a mean direction e.g. when a thunderstorm passes over the aerodrome. The wind should be reported as variable and no reference should be made to the two extreme directions between which the wind has varied.

Visibility

5.12 In reports to Air Traffic Services, visibility along the runway(s) shall be reported together with the units of measurement used to indicate visibility .

5.13 If the visibility is observed from more than one location along the runway, the values representative of the touchdown zone should be reported first, followed, as necessary, by the values representative of the midpoint and stop-end of the runway, and the locations for which these values are representative should be indicated;

5.14 When there is more than one runway in use and the visibility is observed related to these runways, the available visibility values for each runway should be reported, and the runways to which the values refer should be indicated.

5.15 The visibility shall be reported as stated in Chapter 4. However, when the visibility is 10 km or more it shall be given as 10 km, unless CAVOK applies.

5.16 Instrumentation used in the measurement of visibility for METAR reports may still be used for reports to ATS, providing that the exposure of the instruments is suitable to provide representative readings for both purposes (representative of the aerodrome for METAR and representative of the landing and take-off areas on the runways). Also,

the instruments shall be capable of producing reports for the required averaging periods, for local routine reports and local special reports, (one minute) and for METAR (ten minutes).

RVR

5.17 The report to ATS includes the RVR reading for the runway in use at the time of the observation. This data may be displayed at the observer's workplace or may be provided by the ATS unit.

5.18 When the RVR is above the maximum value that can be determined by the system in use, it shall be reported using the abbreviation **'ABV'**, and when the RVR is below the minimum value that can be determined by the system in use, it shall be reported using the abbreviation **'BLW'.**

5.19 Equipment used to determine and display dynamic Instrumented Runway Visual Range (IRVR) information to ATS is subject to requirements specified in CAP 670 ATS Safety Requirements.

5.20 The procedure for the calibration of Human Observer RVR reference tables is described in Appendix C, Human Observed RVR conversion table.

5.21 Information and operational procedures for the assessment of RVR using an IRVR system or by the Human Observer method are described in CAP 168 Licensing of Aerodromes, CAP 493 Manual of Air Traffic Services Part 1 and, where appropriate, in the ATC unit Manual of Air Traffic Services Part 2.

Present weather

5.22 In reports to Air Traffic Services, up to three present weather codes, with a maximum of nine characters, may be reported when simultaneously occurring phenomena is observed. Additionally, the word 'NIL' is inserted into the report if there is no weather significant to aviation.

When CAVOK conditions exist, ‘CAVOK’ is still reported in lieu of present weather.

5.23 The relevant intensity of the reported present weather phenomena should be indicated as follows: Light, Moderate or Heavy respectively.

Cloud

5.24 In reports to Air Traffic Services, cloud layers above 5000 ft shall be omitted, but CB and TCU shall always be reported whatever the height of the cloud base.

5.25 ‘No significant clouds’ or ‘NSC’ shall be reported when no cloud below 5000 ft and no CB or TCU are present.

Temperature

5.26 In reports to Air Traffic Services, these temperatures should be prefixed ‘PS’ when the temperature is positive and ‘MS’ when negative.

Pressure

5.27 In reports to Air Traffic Services, aerodrome QNH, QFE / threshold QFE and, if appropriate, threshold QFE(s) shall be reported.

5.28 At aerodromes that have an instrument runway with a threshold elevation 7ft or more below the aerodrome elevation, a threshold QFE will be provided during periods that the runway is in use.

5.29 Correction tables can be generated for a particular datum using a formula available from the CAA UK Meteorological Authority on request.

Recent weather

5.30 In reports to Air Traffic Services, when reported by a semi-automatic observing system, recent weather should be reported as stated in Chapter 4.

Supplementary information

5.31 In reports to Air Traffic Services, extra data of use to pilots may be reported in the form of 'supplementary information'. This should include but is not limited to:

1. Marked variations in visibility.
2. Aircraft reports (Air-reports) of severe turbulence and icing, but only after notification to the meteorological forecast office.
3. Fog in the vicinity, with a direction to indicate the location, and patches or banks of fog with their location.
4. Distance and direction of showers in the vicinity.
5. Aircraft reports (Air-reports) of wind shear.
6. Significant meteorological conditions, particularly those in the approach and climb-out areas. These may include cumulonimbus clouds, thunderstorms, hail, severe squall lines, freezing precipitation, severe mountain waves and blowing snow.

5.32 Where directions of phenomena are given, one of the eight main compass points shall be used.

5.33 Supplementary information should not be used for relaying forecasts. In this context, 'fog to the west' may be used but 'fog thickening' may not.

5.34 Aircraft reports (Air-reports) of severe turbulence and icing are to be notified to the Meteorological Forecast Office. Unless otherwise advised by the Meteorological Forecast Office, or locally agreed between the ATS Provider and the Aerodrome Meteorological Observation Service Provider, the observer should then include this information as part of the report to Air Traffic Services. If reported, the

entry will be repeated on the following observation, and thereafter removed unless otherwise advised of the continuation of such conditions. The meteorological forecaster may issue a 'SIGMET' warning as a result of Aircraft Reports (Air-reports) of severe turbulence and icing.

Special reports for air traffic services purposes

5.35 Local special reports to the ATS Provider shall be made if a deterioration or improvement in a weather element passes through pre-determined criteria but not at the time of the routine weather observation. At civil aerodromes, special reports need only be sent to the ATS Provider.

5.36 Special reports to the ATS Provider shall use the following change criteria, unless otherwise agreed with the CAA UK Meteorological Authority, or if applicable, by local arrangement with aerodrome users:

Surface wind

5.37 Special reports for wind shall be issued only when the Air Traffic Services Provider has no serviceable wind indicator. Criteria are to be agreed locally, based on changes of operational significance at the aerodrome; Otherwise the following changes from that given in the latest local report shall be issued:

1. A change in the mean direction of 60 degrees or more, the mean speed before or after the change being 10 knots or more, but a change of 30 degrees when 20 knots or more.
2. A change in the mean speed of 10kt or more.
3. A change in gust speed of 10kts or more, the mean speed before or after the change being 15kt or more.

5.38 ATC operations without real-time surface wind information shall either be conducted in accordance with existing approved procedures or must be notified to the relevant Manager ATS Safety Regulation Operations as soon as practicable and the operational procedures agreed.

Surface visibility

5.39 Issued when the visibility changes from one of the following ranges to another:

- 10 km or more
- 5000 m to 9 km
- 3000 m to 4900 m
- 2000 m to 2900 m
- 1500 m to 1900 m
- 800 m to 1400 m
- 750 m or less

5.40 At the onset or cessation of the requirement to report minimum visibility.

5.41 If the minimum visibility is being reported, when the minimum visibility changes from one of the ranges, given in a) above, to another.

5.42 Additional change groups of 100 m or less, 150 to 300 m, 350 to 550 m and 600 to 750 m are used where an RVR is not available, either permanently or during temporary unserviceability. These criteria will apply by local arrangement.

5.43 Additional change groups may be used to meet local operational needs. Details of any additional change groups used at aerodromes shall be published in the UK AIP.

Runway visual range

5.44 Special reports for RVR are only made by local arrangement. Issued when the visibility changes from one of the following ranges to another:

- 800 m or more
- 550 m to 750 m
- 300 m to 500 m
- 275 m to 175 m
- 175 m to 50 m
- 50 m or less

5.45 When the RVR is above the maximum value that can be determined by the system in use, it shall be reported using the abbreviation **'ABV**', and when the RVR is below the minimum value that can be determined by the system in use, it shall be reported using the abbreviation **'BLW'.**

Present weather

5.46 The onset, cessation or change in intensity of any of the following weather phenomena or combinations:

- freezing rain or freezing drizzle of any intensity
- freezing fog
- moderate or heavy precipitation (including showers)
- thunderstorm (with or without precipitation)
- squall, funnel cloud
- low drifting or blowing: snow, sand or dust

5.47 The relevant intensity of the reported present weather phenomena should be indicated as Light, Moderate or Heavy.

Cloud

5.48 Issued when the lowest cloud of over 4 oktas (BKN or OVC) changes from one of the following ranges to another:

- 2000 ft or more
- 1500 ft to 1900 ft
- 1000 ft to 1400 ft
- 700 ft to 900 ft
- 500 ft to 600 ft
- 300 ft to 400 ft
- 200 ft
- 100 ft
- Less than 100 ft
  (including sky obscured)

5.49 When the amount of cloud below 1500ft changes from 4 oktas or less (nil, FEW or SCT) to more than 4 oktas (BKN or OVC), and vice versa.

Temperature

5.50 When the air temperature changes by 2.0 degrees from that given in the last report.

Pressure

5.51 When the ‘as read’ pressure changes by 1.0 hectopascal or more since the last report.

Recent Weather

5.52 When reported by a semi-automatic observing system recent weather should be reported as stated in Chapter 4.

Chapter 6

General requirements for observing equipment

Introduction

6.1 Meteorological observing equipment shall provide a timely and accurate source and display of meteorological information to aid in the safe and expeditious flow of civil air traffic.

6.2 The purpose of this chapter is to provide requirements and recommendations covering all meteorological instruments and systems installed at UK aerodromes. It covers the performance criteria and safeguarding of meteorological equipment installed at the aerodrome and intended to be used for the origin of aerodrome weather reports.

6.3 The Aerodrome Meteorological Observing Service Provider should ensure that appropriate consideration and provision for service continuity of observing equipment has been made, including any necessary support facilities, such as backup power supply etc.

6.4 It is recommended that, where appropriate, a formal agreement such as a Service Level Agreement, be reached between the Aerodrome Meteorological Observing Service Provider and the agency(s) providing meteorological equipment maintenance and calibration services.

General requirements

6.5 Equipment installed shall have been designed following design practices as described below and in Chapter 7, Design Requirements for Meteorological Equipment.

6.6 These shall include:

a. The existence of appropriate technical specifications for the equipment.

b. Calibration standards traceable to a recognised national or international standard.

6.7 Wherever possible the observing equipment should be designed in such a manner that a) the system alerts the user to a failure of part or all of the equipment or power supply or b) that such faults should be obvious to the user.

6.8 Equipment shall operate within and recover to the tolerance values specified in each element's requirements from the ranges given for each element in Chapter 7, Design Requirements for Meteorological Equipment.

6.9 The instrument housing shall be designed to prevent atmospheric influences and radiation errors from affecting the parameters measured by the installed sensor(s), whilst allowing a free flow of air across the sensor(s), to enable the sensor to represent the ambient environment.

6.10 Sensors are required to be positioned in such a manner that allows them to measure meteorological elements free of other influences e.g. jet-engine wash.

Operation and maintenance requirements of meteorological equipment

6.11 Equipment should be installed in accordance with the manufacturer's or supplier's instructions and shall be tested to confirm correct and reliable operation.

6.12 The frequency of calibration checks, replacement and servicing intervals shall be specified and based on manufacturers' recommendations, or if operational experience indicates a need, more frequently. Additional guidance on calibration requirements for wind and pressure measuring equipment is detailed in Appendix J.

6.13 Re-calibration shall be traceable to national and international standards. This may be achieved through a recognised accreditation

scheme such as the National Accreditation of Measurement and Sampling (NAMAS). NAMAS is a service of the United Kingdom Accreditation Service (UKAS).

6.14 UKAS can be contacted at 2 Pine Trees, Chertsey Lane, Staines-upon-Thames, TW18 3HR. Tel: 01784 429000 or Email: info@ukas.com, or see www.ukas.org.

6.15 Routine care and maintenance must be scheduled to ensure that equipment continues to operate effectively within calibrated limits. This may include tasks such as cleaning sensor heads, clearing sensor ports of debris and checking for water leaks from rain.

6.16 Atmospheric pressure measuring equipment shall be checked daily for signs of sensor drift by comparison with other instrumentation on the aerodrome or readings from nearby aerodromes. Appendix D, Daily Atmospheric Pressure Equipment QNH Check, provides an example of the type of form that may be used to assist in the monitoring process.

NOTE: Semi-automated observing systems comprising duplicate or triplicate sensors that carry out automatic comparison between individual sensors would be considered to be an acceptable means of compliance with this paragraph.

6.17 Maintenance activity that will render the equipment unable to provide information or liable to produce inaccurate information should be scheduled at times during which the loss of data is not operationally significant (ideally outside aerodrome operating hours). Alternatively, the equipment shall be withdrawn from service until the maintenance is completed.

Installation of meteorological observing equipment

6.18 Guidance should be sought, as required, from the CAA's aerodrome section on the suitability of location of new sensors and observing systems for safeguarding purposes.

6.19 Siting and performance requirements of instrumentation are given in Chapter 7, Design Requirements for Meteorological Equipment.

6.20 Aerodromes that are certified under the SES Common Requirements as an Air Navigation Service Provider are required to ensure that all required meteorological equipment is included within the unit safety case or the unit's safety assurance documentation whichever is applicable.

6.21 Aerodromes that are not certificated as a MET Air Navigation Service Provider under the SES Common Requirement and have Instrument Approach Procedures without an Instrument Runway and/or Approach Control are required to ensure that all required meteorological equipment is included within the aerodrome's safety case and/or safety assurance documentation as applicable.

Chapter 7

Design requirements for meteorological equipment

Introduction

7.1 The purpose of this chapter is to provide minimum standards for meteorological equipment at UK aerodromes producing METAR reports and at other aerodromes as specified in Chapter 1, Paragraphs 1.5. and 1.6.

7.2 The Aerodrome Meteorological Observing Service Provider should ensure that appropriate consideration and provision for service continuity of observing equipment has been made, including any necessary support facilities, such as backup power supply etc.

7.3 If backup sensors are available, the procedures for use, operational limitations and maximum period of use must be documented by the Aerodrome Meteorological Observing Service Provider.

7.4 Sensor siting shall not encroach the obstacle limitation surface or obstacle free zones. However, consideration may be given by the CAA Safety and Airspace Regulation Group to the collocation of sensors on existing structures on the aerodrome.

7.5 Notwithstanding the constraints listed in paragraph 7.4, the exposure of the sensor should minimise the effects of all obstructions. The tower used to mount the wind sensor is not considered an obstruction to the sensor collection system but, with the exception of the temperature, dew point, and pressure sensors, it should be at least 3 m away from all other meteorological sensors. Sensors should be located as far as practicable from any source likely to significantly affect the quality of the data.

7.6 The display shall present a clear and unambiguous indication of the operational status of the sensor system to the user, in a format applicable to the proposed installation.

7.7 Where possible, the equipment should be self-monitoring and provide a suitable indication of equipment status and serviceability.

7.8 Where equipment is not self-monitoring, a failure of the equipment should be obvious.

Meteorological displays

Performance

7.9 Meteorological displays that present dynamic meteorological information to ATS is subject to the requirements contained in CAP 670 ATS Safety Requirements.

7.10 Where separate display systems are used to source data for the preparation of METAR reports and for the presentation of dynamic meteorological information to ATS, the display device for the METAR shall be designed in such a way as to draw the attention of the operator to significant changes in the displayed meteorological information. (A significant change is defined in Chapter 5, Weather Reports to Air Traffic Services, paragraphs 5.35 to 5.51.)

7.11 The wind sensor display shall indicate whether the direction is referenced to True North or Magnetic North.

7.12 On aerodromes with more than one wind sensor, the display shall clearly indicate the sensor or location from which the information is derived.

7.13 Numeric or graphical displays used to display other forms of meteorological information shall provide a clear indication of function and assignment.

7.14 Equipment that displays times and records of observations (or sampled data) shall reflect UTC and be accurate to ± 15 seconds.

7.15 On semi-automated meteorological observing systems, an area of the screen may be made available for the display of supplementary information.

7.16 Equipment used to provide dynamic meteorological information solely to the Meteorological Observer should be refreshed and updated regularly and at least every 5 minutes.

Backup

7.17 Appropriate contingency arrangements should be in place in the event that any display or display system fails; where this occurs with a semi-automated meteorological observing system, the contingency should take into account any limitations of observers' certification.

Surface wind speed and direction equipment

7.18 This section details the performance criteria and siting of surface wind measurement equipment installed at UK aerodromes for METAR purposes.

7.19 Reports disseminated off the airport in METAR code shall be in compliance with the requirements of Chapter 4, METAR Structure and UK Coding Rules and the information given to ATS Providers shall comply with the requirements in Chapter 5, Weather Reports to Air Traffic Services.

7.20 Where separate sensor and display systems are used to source data for the preparation of METAR reports and for the presentation of real-time reports to ATS, the equipment used to provide real-time information to ATS is subject to the requirements contained in CAP 670 ATS Safety Requirements.

Siting

7.21 For METAR reports, sensors shall be positioned to represent the wind flow at 10 m above the surface. Measurements from sensors positioned between 8 and 13 m high need no corrections; measurements from sensors positioned between 5 and 7 m or 14 and 15 m high should be increased by 10% or decreased by 10% respectively. The minimum acceptable height for the primary wind sensor is 5 m.

7.22 For reports to Air Traffic Services, sensors shall be positioned to represent the wind flow at 10 m above the surface. Measurements from sensors positioned between 8 and 13 m high need no corrections; measurements from sensors positioned between 5 and 7 m or 14 and 15 m high should be increased by 10% or decreased by 10% respectively. The minimum acceptable height for the primary wind sensor is 8 m.

Performance

7.23 The wind speed and direction measuring equipment shall provide an accurate and representative measurement of wind speed and direction.

7.24 Wind direction data should be oriented with respect to True North.

7.25 The wind speed measurement shall be to an accuracy of within plus or minus 1 knot, or plus or minus 10 per cent for wind speeds in excess of 10 knots, of the actual wind speed (whichever is the greater), over the following range:

Table 5: Tolerance values of sensors and equipment

Variable	In tolerance operating range	Recoverable range
Windspeed	0 to 100 knots	0 to 130 knots

7.26 Aerodromes that are certificated under the EASA Common Requirements (Commission Implementing Regulation (EU) 2017/373) as an Air Navigation Service Provider but do not routinely disseminate MET information beyond the aerodrome and are without published or airport owned instrument approach procedures shall provide wind

speed measurements to an accuracy of at least ±2kt or 5% whichever is greater.

7.27 With wind speeds in excess of 2 knots, the wind direction system shall be capable of producing an overall accuracy better than plus or minus 10 degrees.

7.28 The sensor shall be sampled at a minimum rate of four times every second. Where wind systems measure the gust, the equipment shall calculate the 3 second gust as a rolling average of the wind speed samples.

7.29 The equipment shall be capable of producing 2 and 10 minute rolling averages of the wind speed and direction. The algorithms used for the production of such averages shall be defined.

7.30 The average direction displayed shall take regard of the numerical discontinuity at North.

7.31 The information reported shall be compliant with Chapter 4, METAR Structure and UK Coding Rules and Chapter 5, Weather Reports to Air Traffic Services, with respect to marked discontinuity of the wind, wind variation and maximum wind speed (gusts).

Backup equipment

7.32 Alternative anemometry, meeting the above requirements and located on the aerodrome may be used as a backup to the wind information.

7.33 Exceptionally, a hand-held anemometer may be used for a METAR report. Such instrumentation should be used in accordance with manufacturer’s recommended procedures. Readings taken at ground level should be corrected to a height of 10 m.

Pressure measurement equipment

7.34 This section details the performance criteria and siting of ground based pressure measuring equipment installed at UK aerodromes for METAR purposes.

7.35 Pressure sensors can accurately measure atmospheric pressure and will provide representative data for the aerodrome weather report provided the sensors are correctly located and maintained in accordance with this document.

7.36 The following requirements relate to the basic measurement of pressure and any derived values such as QNH and QFE.

7.37 Pressure sensor derived values are of critical importance to aviation safety and operations. Great care shall be taken to ensure that pressure sensor siting is suitable and provides accurate data.

Siting

7.38 The equipment shall be installed so that the sensor measurements are suitable for the operational purpose and free of external influences.

7.39 If the equipment is not installed at the same level as the notified aerodrome elevation, it shall be given a correction factor, in order to produce values with respect to the reference point.

7.40 Where required, the manufacturer's recommended venting method shall be employed to isolate the sensor from the internal environment.

7.41 The pressure sensor shall be installed on the aerodrome, usually in a weatherproof facility (building, shelter, enclosure, etc.).

7.42 In most cases, internal venting of the pressure sensors will be satisfactory. However, if it is determined that internal venting may affect the altimeter setting value to the extent that it is no longer within the accuracy limits given below, outside venting should be used. When the pressure sensor is vented to the outside, a vent header shall be used. Siting that will cause pressure variations due to air flow over the venting

interface should be avoided. The venting interface will be designed to avoid and dampen pressure variations and oscillations due to “pumping” or “breathing” of the pressure sensor venting equipment.

7.43 The sensors should also be located in an area free of jarring, vibration, and rapid temperature fluctuations (i.e. avoid locations exposed to direct sunlight, drafts from open windows, and out of the direct path of air currents from heating or cooling systems). If the pressure sensors are sited outdoors, the height of the vent header shall not be less than one 1 metre above ground level. Regular inspections of the vent header shall be carried out to ensure that the header does not become obstructed by dust etc.

Performance

7.44 No observing system, that determines pressure automatically, shall be dependent upon a single sensor for pressure measurement. A minimum of 2 colocated sensors shall be used. The pressure sensors shall be accurate to within 0.5 hectopascals of each other.

7.45 In the event of failure of one or more individual pressure sensors, or where pressure sensors are not accurate to within 0.5 hectopascals of each other, the system shall not provide any pressure reading to the user.

7.46 Automatic sensors shall be sampled at a minimum rate of once per minute in order to detect significant changes.

7.47 For manual systems, a single, calibrated, barometer may be used for pressure measurement by an observer.

7.48 The measurement system shall provide a pressure reading to an accuracy of ±0.5 hectopascals, or better over the following range:

Table 6: Tolerance values of sensors and equipment

Variable	In tolerance operating range	Recoverable range
Pressure	900 to 1050 hPa	850 to 1200 hPa

7.49 The sensor shall provide an output with a minimum system resolution of 0.1 hPa.

7.50 Aerodromes that are certified under the EASA Common Requirements Commission Implementing Regulation (EU) 2017/373 as an Air Navigation Service Provider but do not routinely disseminate MET information beyond the aerodrome and are without published or airport owned instrument approach procedures shall provide pressure information to an accuracy of at least ± 1hPa, and to a resolution of at least 1 hPa.

7.51 Observing systems that determine pressure automatically shall be designed in such a way as to draw the attention of the operator to a change of 1.0 hectopascal or more in the ‘as read’ pressure from the previous reading to 1 decimal place, (e.g. 998.4 hPa to 997.4 hPa).

7.52 Primary and backup atmospheric pressure measuring equipment should be checked daily for signs of sensor drift by comparison with other pressure instrumentation on the aerodrome or other suitable location. Appendix D, Daily Atmospheric Pressure Equipment QNH Check, provides an example of the type of form that may be used to assist in the monitoring process.

7.53 Observing systems comprising of more than one pressure sensor that employ documented internal cross-checking processes, do not require additional checks for pressure sensor drift.

NOTE: Although observing systems comprising of more than one pressure sensor that employ documented internal cross-checking processes do not themselves require additional checks, these sensors if correctly maintained, would be considered to be acceptable instrumentation against which to carry out daily checks of backup sensors.

Backup

7.54 Suitable backup instrumentation:

- Precision aneroid barometers

- Digital Precision Pressure Indicators

Temperature and dew point measurement

7.55 This section details the performance criteria and siting of temperature and dew point measuring equipment installed at UK aerodromes.

Siting

7.56 The sensors should be mounted at a height of 1.25 to 2 m, above an earth or grass surface away from buildings and other structures likely to influence the reading. The sensors shall be exposed in an instrument housing, which provides protection from atmospheric radiation and water droplets either as precipitation or fog. Consideration should be given to siting sensors away from exhausts of building heating and equipment cooling systems.

Performance

7.57 The equipment shall be capable of measurement to an accuracy better than plus or minus 1.0 degrees Celsius for air temperature and dew point, over the following range:

Table 7: Tolerance values of sensors and equipment

Variable	In tolerance operating range	Recoverable range
Temperature	minus 25°C to plus 50°C	minus 30°C to plus 70°C
Humidity	5 to 100% RH condensing	0 to 100% RH condensing

7.58 Dew point shall be displayed for temperatures below zero; frost point should not be displayed.

7.59 Temperature and dew point measurements shall be measured to a resolution of 0.1 degrees Celsius.

7.60 Electronic sensor(s) shall be sampled at minimum of once per minute.

Backup

7.61 Alternative sensors shall be provided with an accuracy better than plus or minus 1.0 degrees Celsius for air temperature and dew point. Sensors or readouts should be easily accessible to the duty observer. Backup sensors mounted in the vicinity of the VCR should be contained in an instrument housing which is appropriately exposed and protected from the bulding heating and cooling systems.

Cloud base recorder systems

7.62 This section details the performance criteria and siting of cloud base measuring equipment installed at UK aerodromes, and requirements regarding the display of information from the equipment. Installation and use of such equipment is mandatory for licensed aerodromes with precision approach runways, and also for aerodromes providing automated observations. At any other aerodromes, a cloud base recorder is optional.

7.63 When automated equipment is used for the measurement of the height of cloud base, height of cloud base display(s) should be located in the appropriate aerodrome control tower. The display(s) in the aerodrome control tower and the display(s) used by the aerodrome meteorological observers should relate to the same sensor, and where separate sensors are required, the displays should clearly identify the area monitored by each sensor.

7.64 A cloud base recorder can provide valid measurements of the height of cloud elements within the view of the sensor, but this is limited by the detection system’s coverage of the sky. For this reason, sensors used to measure cloud are considered to be an aid to an observer rather than a direct source of information for the METAR. The accredited observer needs to assess the output of the sensors and give a final judgement on the variation of the element over the aerodrome that should be included in the observation.

Siting

7.65 The sensor shall be positioned in accordance with the manufacturer's specifications and is normally mounted on a platform or pedestal. The sensor should be located as far as practicable from other light sources that might affect the measurement.

Performance

7.66 The performance of the cloud base recorder is limited by the view of the sensor. However, the equipment shall be capable of measurement to the following accuracy limits from the surface to 5000 ft above ground level:

- Cloud height ± 30 ft up to and including 300 ft; ± 10% above 300 ft

7.67 The cloud base recorder shall measure to a resolution of 100 ft.

7.68 The sensor(s) shall be sampled at a minimum of once per minute.

7.69 Where appropriate software is utilised, cloud base detection systems may also provide an indication of the cloud amount. A cloud cover algorithm unit calculates the cloud amounts and the heights of different cloud layers, in order to construct an approximation of the entire sky. Such an approximation is limited by the detection system's coverage of the sky and shall not be used in the METAR report unless validated by the accredited observer.

Backup

7.70 Unless further cloud detection systems are available, the accredited observer should assess the amount of cloud by eye and estimate the height, assisted by reference material as appropriate. Human estimates of cloud height, without reference to any form of measuring equipment (particularly at night), may not meet the accuracy requirements stated above.

Visibility measuring systems

7.71 This section details the performance criteria and siting of visibility measuring equipment installed at UK aerodromes. Installation and use of such equipment is mandatory for licensed aerodromes with CAT II and CAT III instrument approach and landing operations, and also for aerodromes providing automated observations. At other aerodromes, such equipment is optional.

7.72 A visibility measuring system can provide valid measurements of the visibility within the range of the sensor. For this reason, sensors used to measure visibility are considered to be an aid to an observer rather than a direct source of information for the METAR. The accredited observer needs to assess the output of the sensors and give a final judgement on the variation of the element over the aerodrome that should be included in the observation.

Siting

7.73 The sensor shall be positioned in accordance with the manufacturer's specifications and is normally mounted on a mast at a height of approximately 2.5 m. The sensor should be located as far as practicable from other light sources that might affect the measurement.

Performance

7.74 The performance of the measuring system is limited by the view of the sensor. However, the equipment shall be capable of measurement to the following accuracy limits to a range of 15 km:

- Visibility ± 50 m up to and including 550 m; ± 10% between 600 m and 1500 m; ± 20% above 1500 m.

7.75 The visibility measuring system shall measure to a resolution of 50 m.

7.76 The sensor(s) shall be sampled at a minimum of once per minute. An averaging period of 1 minute should be used for weather reports to

ATS. An averaging period of 10 minutes for METAR reports should be used, however where a marked discontinuity occurs only those values after the discontinuity should be used for obtaining mean values.

NOTE: A marked discontinuity occurs when there is an abrupt and sustained change in visibility, lasting at least 2 minutes and which reaches or passes through the criteria for the issuance of special reports to ATS as detailed in Chapter 5 paragraphs 5.39 to 5.43 Surface Visibility.

Backup

7.77 Unless further visibility measuring systems are available, the accredited observer should assess the visibility by eye. This should be assisted by the availability of visibility reference points annotated on to a 360° panoramic photograph. At locations where this is possible, suitable reference points that are illuminated at night should also be marked.

Present weather detectors

7.78 This section details the performance criteria and siting of present weather detector equipment installed at UK aerodromes. Installation and use of such equipment is mandatory for licensed aerodromes providing automated observations. At other aerodromes, such equipment is optional.

7.79 The purpose of a present weather detector is to detect precipitation and, in some cases, discriminate type and intensity. Guidance given by weather sensors can be misleading such as when light drizzle and mist occurs; without observing from outside the building, it is often difficult for an observer to determine whether drizzle is present or merely dampness caused by mist or fog.

7.80 Sensors used to detect and measure present weather are considered to be an aid to an observer rather than a direct source of information for the METAR.

Siting

7.81 The sensor shall be positioned in accordance with the manufacturer's specifications. The sensor should be located as far as practicable from the shielding effects of structures, buildings and other obstacles.

Performance

7.82 The sensor should be capable of detecting precipitation of rate greater than or equal to 0.05 mm per hour, within 10 minutes of the precipitation commencing.

7.83 Where intensity is measured, the sensor should be capable of measuring the range of intensity from 0.00 mm per hour to 100 mm per hour and resolve this to 0.1 mm in the range 0-10 mm per hour, 0.5 mm in the range 10.5 to 50 mm per hour and 1 mm in the range 51 to 100 mm per hour. The sensor should be accurate to within ±30% in the range 0.5 to 20 mm per hour.

7.84 The sensor should discriminate the following present weather phenomena and their intensity as a minimum: rain, drizzle, snow, rain and snow, freezing rain, freezing drizzle, fog, freezing fog, mist and haze.

7.85 If the present weather sensor is unable to determine the state or form of the precipitation 'UP' (unidentified precipitation) or 'FZUP' (freezing unidentified precipitation), together with intensity qualifications, should be reported as appropriate.

Backup

7.86 Unless further precipitation systems are available, the accredited observer should assess present weather manually, assisted by reference material as appropriate.

Integrated Met measurement systems

7.87 At aerodromes with runways intended for Category II and III instrument approach and landing operations, automated equipment for measuring and for monitoring surface wind, visibility, runway visual range, height

of cloud base, air and dew-point temperatures and atmospheric pressure shall be installed.

7.88 These systems enable all the Met sensor data to be acquired, measured, processed and made available for subsequent display and use in other systems in real time. In addition these systems enable the METAR to be coded and disseminated on the AFTN. As well as routing information to other systems and displays, the Integrated Met Measurement System enables the production and dissemination of the weather reports if required in the METAR format. Typically measurements of wind, pressure, runway visual range, air and dew-point temperature are used directly with the ability for the human observer to modify or accept the cloud height and amount, visibility and present weather reports.

7.89 The meteorological parameters that are received by the Integrated Measurement System often require processing before they can be used by the Met Observer or ATS staff. It should be noted that there are different processing, display and averaging requirements for Met information used for ATS purposes from that being used to compile meteorological reports.

7.90 Where an Integrated Met Measurement System is used to provide information to ATS displays or ATS systems e.g. ATIS it is required to comply with the SES Interoperability (IOP) Regulation (EC REG 522/2004). Where the Integrated Met Measurement System solely provides information to the Met Observers display IOP approval is not required.

Chapter 8

Dissemination of weather reports

Introduction

8.1 Meteorological reports should be disseminated beyond the aerodrome in a manner agreed between the ATS Provider and the CAA UK Meteorological Authority.

8.2 This is normally achieved by the transmission of routine reports to the UK Civil Aviation Communications Centre (NATS Data Services) by the Aeronautical Fixed Service.

8.3 CAP 493 Manual of Air Traffic Services Part 1 describes the elements of a meteorological report that are routinely required to be passed to pilots by ATC.

8.4 Where the passing of meteorological information increases ATC workload to the extent that the provision of the ATC service is affected, the Provider of ATC should consider the broadcast of meteorological reports on ATIS.

8.5 Meteorological reports included on ATIS is an ATS function and is covered in full detail in CAP 493 Manual of Air Traffic Services Part 1 and CAP 670 ATS Safety Requirements.

8.6 CAP 797 Flight Information Service Officer Manual provides further detail regarding meteorological information passed to pilots by Aerodrome Flight Information Service Officers.

Timing requirements

8.7 In the UK, METARs are transmitted every half hour. Typically observations are made at 20 minutes past the hour (where half-hourly observations are provided) and at 10 minutes to the hour. Since

aerodromes have pre-determined designated places in meteorological bulletins and on VOLMET etc., it is essential that observations are completed in accordance with normal observing practice and are transmitted within 5 minutes of normal dispatch time.

8.8 The Meteorological Forecast Office also requires timely observations to ensure that amendments to Aerodrome Forecasts are issued quickly, and to assist in the timely issue of aerodrome warnings.

METAR

8.9 Once a METAR has been transmitted it will be collected at the Civil Aviation Communications Centre (NATS Data Services) and assembled into pre-determined 'bulletins'. The bulletins are then disseminated via Aeronautical Fixed Service (AFS) channels. Selections of the AFS data will be available on the Aeronautical Fixed Telecommunications Network (AFTN) or via the Satellite Distribution System (SADIS), as agreed between the UK Meteorological Authority, the UK Civil Aviation Communications Centre (NATS Data Services) and ICAO Regional Planning Groups.

8.10 A small selection of METARs are sent for broadcast on VOLMET. VOLMET is a voice broadcast of a set of METARs broadcast on four frequencies covering different regions of the UK with each frequency transmitting a different METAR set. The four regions are London VOLMET (Main), London VOLMET (South), London VOLMET (North) and Scottish VOLMET. Details can be found in the UK AIP GEN 3.5.8.

Chapter 9

Reliability and availability of reporting

Completeness of reports

9.1 The purpose of a weather observation is to provide a complete picture of the conditions at the aerodrome to a variety of recipients.

9.2 The meteorological forecaster is required to take account of all meteorological variables when preparing an Aerodrome Forecast; METARs are used to verify base conditions before forecasting how these elements will change with time. Missing information in the METAR may lead to greater inaccuracies in the forecast which may impact on tactical planning by pilots, operators and other aerodrome service providers.

Contingency arrangements for the failure of meteorological observing sensors and systems

9.3 Contingency arrangements shall be developed and followed in the event of the failure or non-availability of equipment used to derive the content of, or to disseminate[5], an observation.

9.4 Contingency arrangements may include the use of alternative or stand-by equipment, the inclusion in a report of an estimate of the meteorological phenomenon that cannot be sensed or measured, or reporting the element affected as 'not available'. It should be noted that different contingency arrangements may be appropriate when a report to Air Traffic Services is compiled and when a METAR is compiled.

9.5 Contingency arrangements shall be documented.

[5] The CAA is aware that some aerodromes utilise the NATS AFPEx application as a contingency method for dissemination of METARs.

9.6 If a semi-automatic observing system fails an alternative means of recording shall be maintained in order to log all reports.

Missing meteorological aerodrome reports

9.7 If the routine supply of METARs ceases, for whatever reason, there may be an impact on users of the meteorological information (e.g. selection of alternate aerodromes and fuel upload planning) and the provision of an Air Traffic Service. Wherever practical, suitable contingency measures shall be identified and associated operational procedures documented.

9.8 In accordance with ICAO Annex 3, if a regular supply of METARs ceases or is incomplete, the Aerodrome Forecast may be cancelled, as the meteorological forecaster loses the site-specific information on which to confirm the forecast. The forecaster will not issue further Aerodrome Forecasts until the transmission of METARs re-commences.

9.9 In practical terms this means that if a gap of two hours between METAR reports occurs (i.e. more than three half hourly METARs are not received or a second hourly METAR is not received) or if an element is missing from more than three consecutive half-hourly reports then the Aerodrome Forecast will be cancelled. The Aerodrome Forecast will not be re-issued until two complete METARs have been received.

9.10 Accredited observers at some H24 aerodromes take a duty break overnight, of maximum two hours duration. A supply of AUTO METARs will be provided during this period. If the duty observer has not recommenced observations after two hours (i.e. when more than three AUTO METARs are issued) the Aerodrome Forecast may be cancelled.

9.11 The CAA UK Meteorological Authority will be notified if the meteorological forecaster is unable to produce an Aerodrome Forecast

or has to cancel an Aerodrome Forecast because of missing or erroneous information in a METAR.

Timeliness

9.12 The Aerodrome Meteorological Observing Service Provider shall allocate sufficient time resources to the aerodrome meteorological observing staff to enable them to carry out observing duties. The observer may need to assess certain elements of the weather from an outside observing position that is close to ground level. All reports should be checked before issue.

9.13 Data collection for observations made at 20 minutes past the hour must begin no earlier than 10 minutes past the hour. Data collection for observations made at 10 minutes to the hour must begin no earlier than 20 minutes to the hour. The pressure should be the meteorological element that is read as close to the nominal observation time (20 minutes past the hour and 10 minutes to the hour) as possible. Pressure readings shall not be read earlier than 5 minutes before the nominal observation time.

9.14 METAR reports made at 20 minutes past the hour should be transmitted between 20 and 25 minutes past the hour and METAR reports made at 10 minutes to the hour should be transmitted between 10 and 5 minutes to the hour.

9.15 Specials reports, when applicable, should be made without delay and recorded in the appropriate manner.

Chapter 10

Records and archives

Introduction

10.1 A continuous log shall be maintained of all METAR and special reports produced at the aerodrome. These data may be required in the event of an official enquiry relating to an aircraft accident or incident either at, or in the vicinity of the aerodrome and can be useful for planning future aerodrome services.

10.2 When the observations are made using a semi-automated observing system, the system should be arranged either so that a printout of the METAR and special reports is made for retention, or so that the METAR and special reports are stored on a disk, which can be retained for future reference.

10.3 For manual observations, a record shall be maintained to log all the readings and reports.

10.4 In the event of a mistake being discovered in the METAR report, a corrected METAR shall be issued. Following an erroneous log entry, the original value and corrected value shall be clearly indicated, especially when a report has been used by the Air Traffic Service Provider or coded in the METAR. An original erroneous figure must not be deleted and replaced at a later time with a corrected figure. Thus the log will show both the original erroneous report and the subsequent correction with the time at which the correction was made.

10.5 A corrected METAR shall only be issued ahead of the subsequent METAR, typically 30 minutes later. Thereafter, any mistake should be logged only.

10.6 A method shall be established to enable identification of the individual who originates an observation (including any follow-up corrections). Any such record should be retained for at least 30 days.

10.7 Compliance with this requirement does not necessarily require the identity of the observer to be recorded on the equipment used to produce the observation.

Meteorological information records

10.8 Where observing systems are in use, the equipment shall be capable of producing a printed record of all observation reports (METAR, special reports and any non-routine observation at the time of an aircraft accident on or in the vicinity of the aerodrome) produced during the preceding 30 days. Where manual observations are produced, each instrument reading should be recorded in a book or other suitable log, in accordance with World Meteorological Organisation guidance material, and retained for a period of at least 30 days. Similarly where continuous analogue recordings are made of meteorological elements, any charts or other recordings should be retained for at least 30 days.

10.9 Air Traffic Control units should examine the requirements for producing a printed post-incident meteorological report given in CAP 493 Manual of Air Traffic Services Part 1, Section 6, Chapter 1, Paragraph 5.

10.10 METAR and TAF reports distributed via the AFS are stored by the UK Met Office for a minimum of one year. Such data may be accessed on request. The UK Met Office may make a charge for this service.

10.11 Where observing systems sample conditions more frequently than is required for the production of routine or special reports, it is recommended that a facility exists for the system to store the previous 60 minutes of data from each sensor, on command from the observer (for example following the completion of a non-routine observation). Data should be retained for a period of at least 30 days.

10.12 All records and data should be available for examination by the CAA or the UK Air Accidents Investigation Branch (AAIB) on request. The aerodrome shall agree that any data or record provided to the CAA or AAIB may be quoted or used as part of an investigation, legal enquiry or legal proceedings.

10.13 Any records and data of which copies are requested by the CAA or AAIB to assist in the investigation of an incident are to be retained until specifically released by the CAA or AAIB.

Chapter 11

Definitions, abbreviations and bibliography

Glossary

11.1 In CAP746, where a term is used, which is defined by ICAO in a relevant Annex or PANS document, that definition will apply unless:

- the contrary is indicated; or
- there is a different definition in the Air Navigation Order or European Regulations.

11.2 The terms in the table below have been listed for convenience or have been defined to avoid ambiguity or misunderstanding, or to provide definition of words or phrases which have specific meanings within this document. In some cases, there may be slight modifications of definitions in other documents.

Accuracy	A degree if conformance between the estimated or measured value and the true value.
Aerodrome	Any area of land or water designed, equipped, set apart or commonly used for affording facilities for the landing and departure of aircraft.
Aerodrome control service	An air traffic control service to aerodrome traffic.
Meteorological Forecast Office	This is the UK Met Office which is responsible for providing meteorological forecast services for aerodromes in accordance with International and EU regulations.
Aerodrome Meteorological (Stations) Observing Units	A unit on an aerodrome that produces METAR observations or is responsible for the receipt (and onward transmission around the aerodrome, where appropriate) of aerodrome meteorological warnings.
Aerodrome Reference Point	The designated geographical location of an aerodrome.
Aeronautical fixed service	A telecommunication service between specified fixed points provided primarily for the safety of air navigation and for the regular, efficient and economical operation of air services. (ICAO Annex 11, Chapter 1)

Aeronautical Fixed Telecommunication Network	A worldwide system of aeronautical fixed circuits provided as part of the aeronautical fixed service, for the exchange of messages and/or digital data between aeronautical fixed stations having the same or compatible communications characteristics. (ICAO Annex 11, Chapter 1)
Aeronautical Information Publication (AIP)	A publication issued by or with the authority of a State and containing aeronautical information of a lasting character essential to air navigation.
Aeronautical Information Service (AIS)	The Publisher of Notices to Airmen (NOTAM) and United Kingdom Aeronautical Information Publication.
Aerodrome Licensee	In relation to any aerodrome, the person in charge of the aerodrome.
AFPEx	An online NATS application which allows registered users the ability to send and receive AFTN messages from a desktop PC.
Air-report	A report from an aircraft in flight prepared in conformity with requirements for position, and operational and/or meteorological reporting
Air Traffic	All aircraft in flight or operating on the manoeuvring area of an aerodrome.
Air Traffic Control Centre	An air traffic control unit established to provide an area control service to aircraft flying within a notified flight information region which are not receiving an aerodrome control service or an approach control service. (CAP 393 Air Navigation: The Order and the Regulations)
Air Traffic Control Service	A service provided for the purpose of preventing collisions between aircraft, and, on the manoeuvring area, between aircraft and obstructions, and expediting and maintaining an orderly flow or air traffic.
Air Traffic Control Unit	A unit of air traffic controllers established by a person appointed by a person maintaining an aerodrome or other place in order to provide an area control service, an aerodrome control service or an approach control service.
Air Traffic Service	A generic term meaning air traffic control service, flight information service and air-ground communication.
Alternate aerodrome	An aerodrome to which an aircraft may proceed when it becomes either impossible or inadvisable to proceed or to land at the aerodrome of intended landing.
Altitude	The vertical distance of a level, a point or object considered as a point, measured from mean sea level. (ICAO Annex 3, Chapter 1)
Automatic Observing System	An observing system that measures, derives and reports all required elements without human interaction.

Availability	The ability of a system to perform within specified limits, a required function under given conditions, at a given time.
Break	A period of time within the duty period when an accredited Met Observer is not required to perform duties, for recuperation purposes;
CAA	This means the UK Civil Aviation Authority, comprising Directorate of Airspace Policy (in which the UK Met Authority resides), Safety Regulation Group, Economic Regulation Group and Consumer Protection Group.
CAVOK	The visibility, cloud and weather groups are replaced by the term CAVOK (Cloud And Visibility OK) when the following conditions exist simultaneously: a. Visibility is 10 km or more. b. No minimum visibility is reported. c. No cloud below 5000 ft or Minimum Sector Altitude (whichever is the greater). d. No cumulonimbus (CB) or towering cumulus cloud (TCU) at any level. e. No significant weather at or in the vicinity of the aerodrome.
Cloud of operational significance	A cloud with the height base below 1500 m (5000 ft) or below the highest minimum sector altitude, whichever is the greater, or a cumulonimbus cloud or a towering cumulus cloud at any height.
Displayed Gust	This is a wind speed, averaged over a 3 second sample, that has increased from the 2 or 10 minute mean wind speed by 10 knots or more.
Equipment Failure	The inability of equipment to fulfil its operational requirements. Failure may be systematic or due to a physical change.
Functional System	A combination of procedures, human resources and equipment, including hardware and software, organised to perform a function within the context of ATM/ANS and other ATM network functions
Gust	This is the peak wind speed averaged over a 3 second period.
Height	The vertical displacement of a level, point, or object considered as a point measured from a specified datum.
Local routine report	A meteorological report issued at fixed time intervals, intended only for dissemination at the aerodrome of origin where the observations were made
Local special report	A meteorological report issued in accordance with the criteria established for special observations, intended only for dissemination at the aerodrome of origin where the observations were made (i.e. a weather report made following a deterioration or improvement in a weather element through pre-determined

	criteria, that does not occur at the time of the routine weather observation)
Maintenance	The preservation or restoration of the required system performance over the system lifecycle.
May	Used to indicate that the following clause is optional, alternative, or permissive.
METAR	A meteorological report in the format prescribed by the World Meteorological Organisation for worldwide dissemination of aeronautical meteorological information.
Meteorological Bulletin	A text comprising meteorological information preceded by an appropriate heading.
Meteorological observation	A snap-shot of the state of the atmosphere and environment at a given time; comprising one or more meteorological elements, carried out either by visual estimation or with the aid of appropriate instrumentation.
Meteorological report	A statement of the observed meteorological conditions, related to a specific time and location, and prepared according to a prescribed format for subsequent issue to users.
Mitigation	Steps taken to control or prevent a hazard from causing harm and reduce risk to a tolerable or acceptable level.
Observation (Meteorological)	The evaluation of one or more meteorological events.
Observing system	A machine that receives data from one or more instruments measuring meteorological elements and may performs tasks such as data logging, processing and display.
OPMET	Aeronautical meteorological data, describing METAR, TAF, SIGMET, GAMET, Volcanic Ash Graphics.
Precision approach runway	An instrument runway intended for the operation of aircraft using precision approach aids that meet the Facility Performance requirements defined in ICAO Annex 10 appropriate to the Category of Operations.
Prevailing Visibility	The greatest visibility value, observed in accordance with the definition of “visibility”, which is reached within at least half the horizon circle or within at least half of the surface of the aerodrome. These areas could comprise contiguous or non-contiguous sectors. **NOTE:** This value may be assessed by human observation and/or instrumented systems. When instruments are installed, they are used to obtain the best estimate of the prevailing visibility.
Primary Sensor	The sensor normally used to determine the element that is being measured.

QFE	QFE is the atmospheric pressure corrected to a specific elevation e.g. the official aerodrome elevation or the runway threshold elevation.
QNH	QNH is the atmospheric pressure corrected to mean sea level, assuming International Standard Atmosphere conditions across the height difference.
Reliability	The ability of a system to perform a required function under given conditions for a given time interval.
Requirement	A requirement is an expressed or implied need that is satisfied through appropriate compliance action. A requirement may call for compliance to such standards, codes of practice, or specifications as considered appropriate by the regulator.
Routine Maintenance	Maintenance at regular periodic intervals, identified at the systems design stage of equipment, functions, components etc., which are known to cause or potentially cause degradation to the required system performance.
Runway	A defined rectangular area on a land aerodrome prepared for the landing and take-off run of aircraft along its length.
Runway visual range (RVR)	The range over which the pilot of an aircraft on the centre line of a runway can see the runway surface markings or the lights delineating the runway or identifying its centre line.
Semi-automatic observing system	An observing system that allows the augmentation of measured elements and requires a human in the loop for issuing the appropriate reports
Shall (is to, are to, and must)	Means that the requirement or instruction is mandatory.
Should	Means that it is strongly advisable that an instruction or action is carried out, it is recommended or discretionary. It is applied where the more positive ‘shall’ is unreasonable but nevertheless a provider would need good reason for not complying.
SIGMET Information	Information issued by a meteorological watch office concerning the occurrence or expected occurrence of specified en-route weather phenomena which may affect the safety of aircraft operations.
Specification	A precise technical definition of the required parameters or performance to be achieved.
Standard	Characteristics, methods, principles and practices that can be used to satisfy a requirement.
Threshold QFE	QFE is the atmospheric pressure corrected to the runway threshold elevation.
Touchdown zone	The portion of a runway, beyond the threshold, where it is intended landing aeroplanes first contact the runway.

VOLMET	A Very High Frequency broadcast, typically providing METAR reports for a maximum of nine aerodromes on each channel in a continuous loop. Intended for aircraft in flight, it has a range of around 300 nautical miles at FL300.
Visibility	Visibility for aeronautical purposes is the greater of: a. the greatest distance at which a black object of suitable dimensions, situated near the ground, can be seen and recognized when observed against a bright background; b. the greatest distance at which lights in the vicinity of 1 000 candelas can be seen and identified against an unlit background. **NOTE:** The two distances have different values in air of a given extinction coefficient, and the latter b) varies with the background illumination. The former a) is represented by the meteorological optical range (MOR).

Abbreviations

A	AAIB	Air Accident Investigation Branch
	AFS	Aeronautical Fixed Service
	AFTN	Aeronautical Fixed Telecommunication Network
	AIP	Aeronautical Information Publication
	ANO	Air Navigation Order
	ATC	Air Traffic Control
	ATIS	Automatic Terminal Information Service
	ATS	Air Traffic Service
C	CAA	Civil Aviation Authority
	CAP	Civil Aviation Publication
	CAT	Category
	CB	Cumulonimbus
D	DfT	Department for Transport
E	EASA	European Aviation Safety Agency
	EC	European Commission
F	ft	Foot (feet)
H	hPa	Hectopascal
I	ICAO	International Civil Aviation Organisation

	IRVR	Instrumented Runway Visual Range
K	km	Instrumented Runway Visual Range
	kt	Knots
M	Met	Meteorology/Meteorological
	METAR	Aviation routine weather report
	m	Metre(s)
	mm	Millimetres
N	NSC	No Significant Clouds
	NCD	No Clouds Detected (reported by automatic observing systems only)
R	REG	Regulation
	ROP	Runway Observation Point
	RVR	Runway Visual Range
S	SADIS	Satellite Distribution System
	SARP	Standards and Recommended Practice
T	TCU	Towering Cumulus
U	UK	United Kingdom
	UTC	Universal Co-ordinated Time
W	WMO	World Meteorological Organisation

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CAA CAP 797 *Flight Information Service Officer Manual*, UK Civil Aviation Authority

CAA CAP 670 *ATS Safety Requirements*, UK Civil Aviation Authority

Met Office Document No. 2612, *Register of Observations (METAR)*, UK Met Office

Met Office Document No. 796, *Observing Codes for Use at UK Civil Aeronautical Stations*, UK Met Office

Appendix A

Purpose of the aerodrome meteorological regulatory oversight audit

Introduction

A.1 In order to comply with ICAO SARPs, the CAA UK Meteorological Authority arranges for aerodrome meteorological observing units to be visited at regular intervals. The aim of these visits is to ensure that a high standard of observations is maintained, instruments and their displays are functioning correctly and to check the exposure of instruments.

A.2 The CAA UK Meteorological Authority requires regulatory oversight audits to take place at aerodromes that are Designated Meteorological or Air Traffic Service (ATS) Air Navigation Service Providers (ANSPs). All ANSPs that are certificated under Commission Implementing Regulation (EU) 2017/373 as a Meteorological ANSP (i.e. those that provide METARs which are disseminated beyond the aerodrome) are required to be visited annually. Additionally, aerodromes that publish instrument runway procedures are required to have annual audits. Those aerodromes that are Designated as ATS ANSPs and do not provide METARs are required to have audits every 2 years

A.3 The CAA UK Met Authority may vary the frequency of oversight audits based on an assessment of the risks associated with the operations of each organisation.

A.4 Compliance with Commission Implementing Regulation (EU) 2017/373 Annex V Part-MET and relevant sections of Annex III General Requirements will be checked and local meteorological procedures; the standard of weather reports; instrumentation and, if applicable, meteorological flight briefing documentation provided, will be audited.

Specific aspects will be reviewed, in accordance with the Regulation, including:

1. General Organisational Requirements:

   - Personnel Requirements (e.g. organisational structure and individuals with specific MET service responsibilities);
   - Change Management;
   - Findings and corrective actions;
   - Operations Manuals (e.g. Unit MET documentation, availability of MET information to enable Met observers to perform their duties effectively);
   - Technical and Operational competence and capability (e.g. numbers of Observing Personnel);
   - Management System (Training & Competence of MET Personnel);
   - Quality Management (METAR QC);
   - Contingency Plans;
   - Open and transparent provision of services (e.g. consultation with users of MET information and services);
   - Contracted Activities (e.g. MET Equipment);
   - Record Keeping (e.g. MET Equipment Records).

2. Additional Meteorological Service Provider Requirements:

   - Meteorological reports and other information (e.g. the type of meteorological reports provided);
   - Observing and reporting of meteorological elements (i.e. preparation, provision and dissemination of MET reports);
   - Retention of MET information;
   - Location and operation of the MET equipment;
   - Information to be provided to air traffic services units;
   - Information for use by operator or flight crew.

A.5 The inspector may also offer help and advice regarding the provision of meteorological services to both the airport management, observers and users.

A.6 The visit may be used to send completed Register of Observations (Metform 2612) to the Public Record archive and to request new Registers.

A.7 The Met Office will supply Registers of Observations (Metform 2612) free of charge, on the basis that upon completion, these registers may be archived by the Met Office. Archived data and registers may be used in generating climatological data, as noted in the UK AIP (GEN 3.5. Table 3.5.3.2).

Conduct of meteorological regulatory oversight audit

A.8 Meteorological instrumentation will usually be checked during the visit. The exposure and accuracy of the instrumentation will be reviewed, as well as procedures for use of the instrumentation. Backup sensors and contingency arrangements will also be reviewed.

A.9 The Aerodrome Meteorological Observing Service Provider's arrangements for ensuring that all accredited Aerodrome Meteorological Observers maintain their observing competence will be reviewed, and a check will be made of the Service Provider's annual assessments of accredited observers.

A.10 A review of various regulatory documents will be carried out and to assist with the review the Aerodrome Meteorological Observing Service Provider is asked to make relevant documentation readily available for inspection during the audit, or if appropriate, to provide documents prior to the audit, which may include:

i) An inventory of meteorological observing equipment;

ii) Procedures for maintenance and calibration of meteorological observing equipment;

iii) Maintenance and calibration records;

iv) The unit Manual of Air Traffic Services Part 2;

v) Records of accredited Aerodrome Meteorological Observers

A.11 The quality and regularity of METAR observations will be checked prior to the visit and any issues raised on the day.

A.12 The aerodrome entry in UK AIP GEN table 3.5.3.2, AD 2.11 and any weather-related warnings contained within AD 2.20 will be reviewed during the visit and details of any amendments taken.

A.13 Following the visit, a copy of the report detailing any findings arising from the audit shall be sent to the Manager of the Aerodrome Meteorological Observing Service Provider. The unit management will be invited to respond to the findings prior to the target date specified in the report.

A.14 Where appropriate, time during the visit will also be made for meetings with users of meteorological information on the aerodrome, e.g. airlines, flying clubs, handling agents, to discuss the meteorological services provided for their operations. A summary of the discussions will be included in the report.

Appendix B

Frequently asked questions on the compilation of the METAR

Introduction

B.1 There are a number of common queries that are often raised when completing the METAR. Full details can be found in the earlier sections of Chapter 4, but the most frequently asked questions are given below to assist the observer.

FAQs

Wind

B.2 **Which anemometer is used for the METAR report?**

Whatever runway is in use, the wind velocity for the METAR is normally taken from one designated anemometer, and usually is averaged over 10 minutes. It may include a gust speed recorded in that 10 minute period when appropriate.

B.3 **How is the wind direction reported and when is a variation group included?**

Wind direction shall be recorded in degrees true, and shall include a variation group, if, during the previous 10 minutes the direction has varied though an arc of 60 degrees or more but less than 180 degrees and the mean speed during the previous 10 minutes is 3 knots or more.

Visibility

B.4 **What visibility is reported in the METAR?**

In the METAR, the prevailing visibility shall be reported. If the visibility in one direction, which is not the prevailing visibility, is less than 1500 m or less than 50% of the prevailing visibility, the lowest visibility observed shall also be reported and its general direction in relation to the aerodrome

indicated by reference to one of the eight points of the compass. If the lowest visibility is observed in more than one direction, then the most operationally significant direction should be reported. When the visibility is fluctuating rapidly and the prevailing visibility cannot be determined, only the lowest visibility should be reported, with no indication of direction. Examples of how to observe and report prevailing visibility are given in Annex A to this Appendix.

Present weather

B.5 **When is mist reported?**

Mist shall be reported when the prevailing visibility is between 1000m or more and 5000m and the relative humidity will be 95% or more, and as a guide, the difference between the dry bulb and the dew point temperature is usually 1°C or less.

NOTE: If the prevailing visibility is 5000m or less, relative humidity is less than 95% and the difference between the dry bulb and the dew point temperatures is greater than 1ºC you should consider whether the reduced visibility is caused by dust, smoke or haze.

B.6 **How often does heavy rain occur on average?**

Care should be taken to avoid over-estimating the intensity of precipitation. Statistically, in the United Kingdom, light rain falls on 80% of occasions and heavy rain falls on less than 5% of occasions.

B.7 **When should separate weather groups be reported?**

Although up to three weather types may be reported, they should be occurring independently; e.g. a mist or fog group shall not be inserted if the reduction in visibility is due wholly to falling precipitation.

B.8 **How is 10 km visibility and broken cloud at 5500 ft reported?**

CAVOK should be used in this instance.

Cloud

B.9 **How is 8 km visibility and broken cloud at 5500 ft reported?**

When CAVOK does not apply, the visibility, present weather (if applicable)

and cloud groups shall be reported. In this instance, this should be coded as 8000 NSC, provided that the cloud layers are not TCU or CB.

B.10 **When should significant convective cloud types be reported?**

There are two types of significant convective cloud that is reported in the METAR, towering cumulus (TCU) and cumulonimbus (CB). They are associated typically with moderate or heavy showers, but hail and thunder are associated only with cumulonimbus. TCU and CB should be reported in the METAR whenever visible to the observer. There are no agreed criteria for reporting towering cumulus cloud but as a guide, the cloud will be at least 10000 ft tall from base to top.

B.11 **How should I assess the amount of cloud to report in the METAR, if there is no blue sky visible but it is clearly sunny through gaps in the cumulus / towering cumulus / cumulonimbus cloud cover?**

It is very easy to significantly overestimate (sometimes by as much as 4 oktas) the amount of large convective cloud present, by erroneously including the sides of such cloud. Cloud amounts in the METAR refer only to the amount of cloud base present. This automatically discounts cloud sides from the amount to be reported when considering convective cloud. Observers should take care to report only convective cloud bases in METAR reports.

B.12 **Is there an easy way to estimate the height of 'cotton wool' clouds?**

A rough estimate of the height of fair weather convective cumulus cloud base in hundreds of ft may be obtained by multiplying the difference in dry-bulb and dew point temperatures by four hundred.

B.13 **When should 'Sky Obscured', VV/// be reported?**

When the sky is obscured due to fog, falling or blowing snow**, 'VV/// is reported in lieu of cloud information. If during the day, cloud or blue sky can be seen through the fog or blowing snow or, at night, stars are visible, then the sky is said to be visible and cloud would be reported as appropriate. If, due to thick fog or heavy precipitation (usually snowfall), the sky, stars or cloud cannot be seen then Sky Obscured, VV/// would be reported. As a general guide you should consider reporting VV///

whenever the visibility is less than 200 metres unless there is definitive visible evidence of a cloud layer.

****NOTE**: Other phenomena that could cause the sky to be obscured are blowing dust, blowing sand, volcanic ash and in offshore environments, sea spray.

B.14 **Our automated met system is recording OVC002, a prevailing visibility of 200 metres and fog is present at the airfield; is it correct to report these conditions?**

With conditions as stated there is a high probability that the sky will be obscured and VV/// should be reported. Automated sensors are to be considered as an aid to the observer rather than a direct source of information. Given the limitations of sensors observers should always verify automated readings and in this example should confirm the accuracy of the readings by making their own visual assessment of conditions before submitting the report.

Temperature

B.15 **Can the dry bulb temperature be colder than the dew point temperature?**

No. A check should be made that the dry bulb temperature is equal to or warmer than the dew point temperature, particularly when both are negative.

Pressure

B.16 **Which pressure is reported in the METAR – the airfield threshold pressure or the mean sea level pressure?**

Care should be taken to report the aerodrome QNH (mean sea level pressure) in the METAR.

Recent significant weather

B.17 **When should recent weather be reported?**

If since the last routine report, precipitation or blowing snow has been moderate or heavy and has now ceased or decreased in intensity, a recent weather group will be required. This also applies if light freezing

precipitation, a thunderstorm or funnel cloud has recently ceased. Intensity symbols are not used when reporting recent weather.

Runway state group

B.18 **When should a runway state group be reported?**

These will normally be inserted when the runways are contaminated with snow, slush or other contaminants to the extent that the runway characteristics are affected. A repeat of the previously reported group should be indicated in the METAR by changing the first two digits of the runway state group to '**99**'.

Observing from outside the building

B.19 **Is it necessary to carry out observations from outside the building?**

Yes, in certain weather conditions the observer may need to assess elements of the weather from an outside observing position that is close to ground level.

Final checks

B.20 **Are there any other actions to take before transmission of the METAR?**

If time allows, the completed message should be checked through and compared with previous reports for consistency; typographical errors are not uncommon (for example typing 300 m visibility instead of 3000 m).

Restricted meteorological observer's (RMO) certificate

B.21 **The aerodrome's SAMOS is not capable of coding the METAR. I am an accredited Restricted Met Observer – can I manually code and disseminate the METAR?**

No, if there is a system problem which means that the semi-automated observing system is unable to code the METAR an accredited observer holding a restricted certificate will be limited to providing 'Official' local weather reports.

B.22 **The aerodrome's SAMOS is not receiving data from the wind/temperature/pressure sensor but the system is otherwise fully**

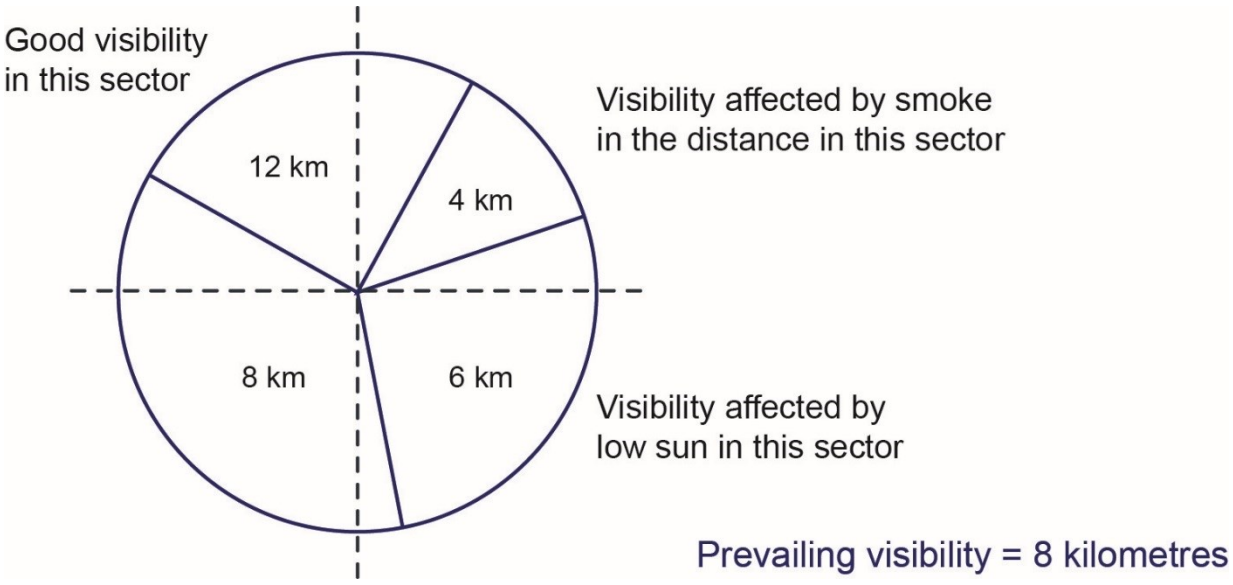
operational. I am an accredited Restricted Met Observer – can I manually enter details read from the contingency sensor(s) allowing the system to automatically code and disseminate the METAR?
Yes, if the semi-automated observing system is able to code the METAR an accredited observer holding a restricted certificate can manually enter the relevant weather elements so that the system can code and disseminate the METAR.

Annex A to Appendix B

Assessing prevailing visibility

c. Mentally divide the horizon circle into as many sectors of equal visibility as needed to measure the differing visibilities, as in the following example:

Figure 1: Assessing prevailing visibility


Good visibility in this sector
12 km
4 km
Visibility affected by smoke in the distance in this sector
8 km
6 km
Visibility affected by low sun in this sector
Prevailing visibility = 8 kilometres

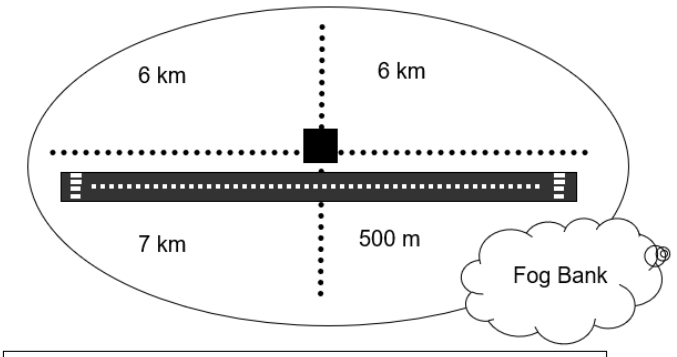
d. Prevailing visibility is the greatest visibility value which is reached within at least half the horizon circle or within at least half of the surface of the aerodrome; in the above example, the visibility value which is reached within at least half the horizon circle is 8 kilometres (the area covered by the 8km and 12km visibility sectors).

e. The lowest visibility is also reported in the METAR when it is less than 1500 metres (providing it is not the prevailing visibility) or less than 50% of the prevailing visibility, along with its general direction. In the above case, the lowest visibility (4 kilometres) is not reported, as it is not less than 50% of the prevailing visibility.

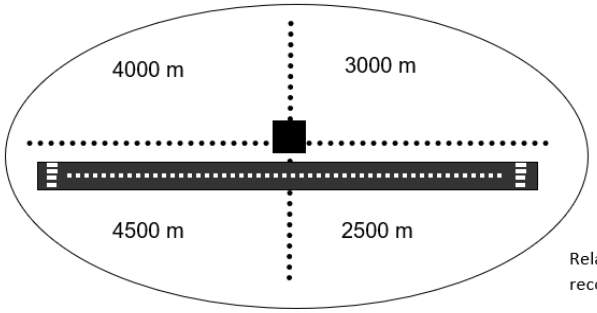
f. Important points to note:

- RVR is included in the METAR whenever the lowest visibility is less than 1500 metres.
- Present weather phenomena such as smoke, mist and fog should be included in the METAR report if the prevailing visibility (or minimum visibility, if reported) reaches the criteria for inclusion of that particular weather group (i.e. 5000 metres or less for smoke, mist, haze and less than 1000 metres for fog and freezing fog). Note that present weather codes for fog patches (BCFG), fog covering a partial part of the aerodrome (PRFG) and fog in the vicinity of the aerodrome (VCFG) may be reported whatever the visibility reported.

Figure 2: Examples of reporting prevailing visibility in the METAR code

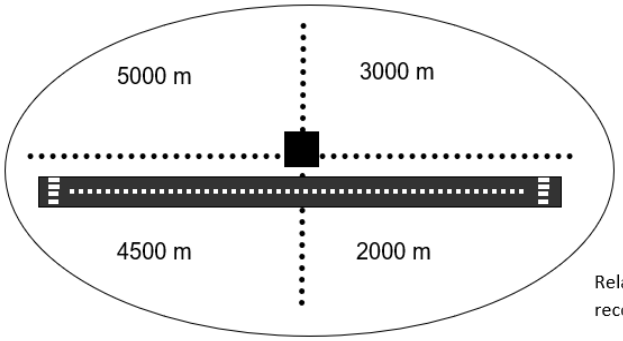


Example 1: Visibility/Present Weather reported as **6000 0500SE PRFG**



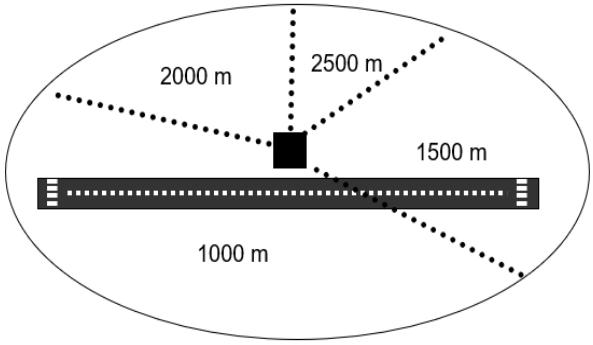
Relative Humidity recorded at 65%

Example 2: Visibility/Present Weather reported as **4000 HZ**



Relative Humidity recorded at 95%

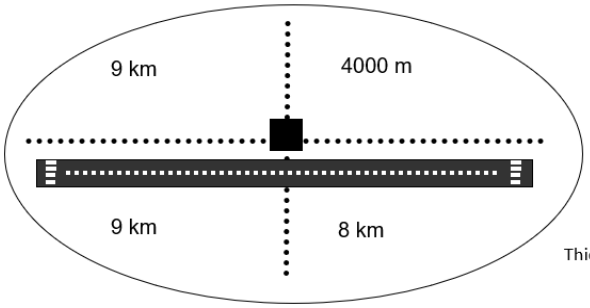
Example 3: Visibility/Present Weather reported as **4500 2000SE BR**



Relative Humidity recorded at 98%

No RVR Triggered

Example 4: Visibility/Present Weather reported as **1500 1000SW R09/P1500 BR**



Example 5: Visibility/Present Weather reported as **9000 4000NE**
(Note that present weather is not reported, to report smoke the prevailing visibility must be ≤ 5000 m)

Appendix C

Human Observed RVR conversion table

Foreword

C.1 This Appendix sets out the requirements for producing the Human Observed RVR Conversion Table.

C.2 The CAA UK Meteorological Authority is responsible for the policy on the production of the Human Observed Runway Visual Range Conversion Table.

C.3 A distance-based methodology shall be used for creating this table.

C.4 Aerodromes shall issue a new RVR Conversion Table following any alterations or changes to the runway lighting system.

C.5 Aerodromes shall ensure that all relevant runway lights are illuminated at the correct intensity in order to use the Human Observed RVR Conversion Tables.

C.6 Details on the issue and use of the Human Observed RVR Conversion Table are found in CAP 168 Licensing of Aerodromes Appendix 2A.

Distance-based method

C.7 This method establishes the distance from the Runway Observation Position (ROP) to each of the runway edge lights on the opposite side runway from the ROP. Using the far side lights provides the observer with a better assessment of the individual lights along the runway than would be achieved using the same side lights. With this method the straight line distance from the ROP to each light is derived from the aerodrome survey (detailed in CAP 232 Aerodrome Survey Information Chapter 5) and this becomes the reported RVR, noting the UK standard reporting steps:

0 to 400 m in 25 m steps

400 to 800 m in 50 m steps

800 to 1500 m in 100 m steps

C.8 The aerodrome is responsible for producing a Human Observer RVR Conversion Table (an example is provided at Annex A).

Reference copies

C.9 HORVR conversion tables should be retained and managed by the aerodrome as part of the unit document management procedure.

Annex A to Appendix C

Distance based method example

HUMAN OBSERVER RVR CONVERSION TABLE

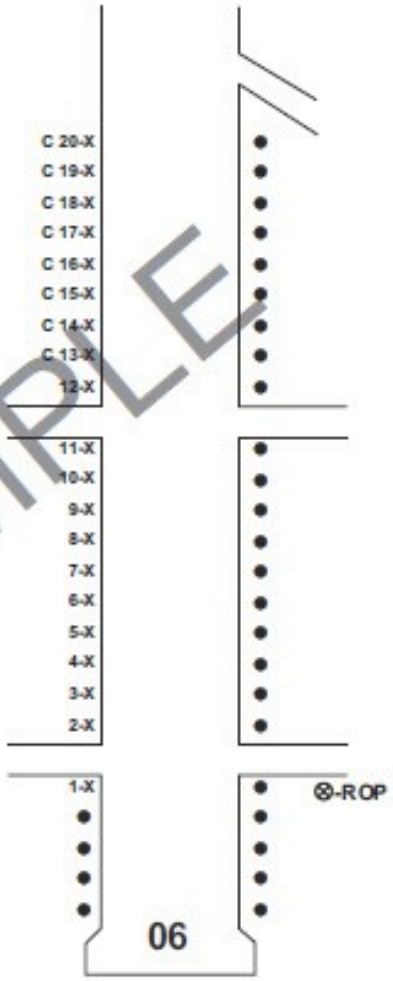
AIRFIELD	SOUTHEND	RUNWAY	06	TOUCHDOWN	
LIGHT TYPE	ZA 105 Mk111		DATE OF MEASUREMENT		01/01/99
METHOD USED	DISTANCE of ROP to RUNWAY EDGE LIGHTS				

Number of lights just visible	RVR
1	75
2	125
3	175
4	225
5	300
6	350
7	400
8	450
9	500
10	600
11	650
12	700
13	750
14	800
15	900
16	900
17	1000
18	1000
19	1100
20	1200

X Lights used for RVR | F Flush light | C Coloured light

● Lights not used for RVR | ⊗ Position of ROP

(NOT TO SCALE)



EXAMPLE

1 The diagram indicates by crosses and numbers the sequence of runway lights to be counted. Runway lights indicated by dots (●) on the diagram must NOT be included in the count even if visible.

2 The RVR given above is valid at 100% intensity setting.

3 This table is valid only for observations made from the specified ROP. The table remains valid for three years from the calibration date shown above. A change to any element of the RVR system renders the table invalid.

4 The procedures for no lights visible beyond the last calibrated light are set out in the RVR section of CAP 168.

SPECIAL NOTES

Aerodrome Survey Carried out on: *(date)*

Distances provided by: *(surveying company)*

ISSUED BY Southend Airport

Appendix D

Daily atmospheric pressure equipment QNH check

D.1 Atmospheric pressure measuring equipment shall be checked daily for signs of sensor drift by comparison with other pressure instrumentation on the aerodrome. However, the check should not take place if the mean wind speed exceeds 25kts, or when the pressure change is greater than 1 hectopascal per hour, as this may adversely affect the comparison.

D.2 The Aerodrome QNH (to the nearest tenth of a hectopascal) should be used in the comparison.

D.3 The use of the table below to record the daily pressure check may indicate sensor calibration drift before the sensor reaches the limits of allowed accuracy. However, if differences consistently reach 0.5hPa then calibration of the barometer should be brought forward.

Date	Primary sensor	Backup sensor	Difference
…	…	…	…

Appendix E

Theoretical observer training requirements for an Aerodrome Meteorological Observer's (AMO/Full) certificate

Introduction

E.1 The objective of the theoretical training is to provide tuition in the skills required to accurately and reliably produce weather reports to ATS and to issue reports in the METAR format.

E.2 The theoretical training is intended to be classroom based. On successful completion of the theoretical training, the trainee will be eligible to go forward for practical observer training session and, on suitable completion of this, will be awarded a meteorological observing certificate.

Training programme

E.3 The purpose of the theoretical training is to instruct the trainee observers on observing techniques and how to correctly encode and decode weather reports. The trainee will also be given instruction on how to carry out simple care and maintenance of instruments.

E.4 Details of the Approved Training Organisations are included in the UK AIP Section GEN 3.5.

Syllabus

E.5 The training shall provide instruction on the following:

- The process of compiling and preparing weather reports, especially using the METAR code.
- The reporting of the surface wind measurements, including backup facilities.
- The observing and reporting of visibility by day and by night.

- Runway visual range (RVR) - familiarisation with the code and when to report.
- The observing and reporting of "present weather" in its various forms, including the relationship between humidity and reporting of Mist/Haze.
- The observing and reporting of cloud base and height, including when to report CAVOK, no significant cloud and sky obscured. Identification of convective clouds and their reporting in the METAR code.
- The reporting of temperature and determination of dew point values, especially the attention and care required when reporting sub-zero temperatures.
- The observation of atmospheric pressure and the reporting of QNH and QFE.
- Runway State - familiarisation with the code and when to report.
- When and how to report "Recent Weather".
- The criteria and process for issuing special weather reports.
- Familiarisation with OPMET bulletins containing METAR reports.
- Interpretation of standard weather charts to self-brief on the prevailing weather

Examinations

E.6 At the end of the theoretical training, the trainee will demonstrate their understanding of the theory by sitting a written examination. The trainee is expected to obtain a pass in order to go on to practical training.

Appendix F

Practical observer training requirements for an Aerodrome Meteorological Observer's (AMO/Full), certificate

Introduction

F.1 The purpose of the practical training is to apply the theoretical knowledge gained in the context of an operational environment and to enable the practical competence of the observer to be assessed.

F.2 The practical training will concentrate on the correct application of meteorological observing techniques, use of a range of meteorological instrumentation including, but not limited to, semi-automated observing systems.

F.3 Whenever possible, practical training should follow immediately after the theory training. This will allow the student to gain confidence in using instrumentation, as well as allowing an assessment of the observing competence of the student to be carried out.

F.4 It is recommended that the formal practical observer training should last between 4 days and 2 weeks.

Training organisations

F.5 The training programme, examinations and competency of aerodrome meteorological observers shall be approved by the CAA UK Meteorological Authority. This is to ensure that the standard of observing training is uniform for all students. Details of the approval process are available from the CAA UK Meteorological Authority on request.

F.6 Practical training shall be supplied by suitably experienced observers, having at least 5 consecutive years' experience of aviation meteorological

observing. Ideally the experience will have been gained from working at more than one aerodrome and also have included experience of producing both fully manual observations and observations assisted by automated meteorological weather observing systems. Thus observers providing practical training will have a wide perspective on different observing methodologies used in the UK.

F.7 A training supervisor (who may also be one of the observing staff discussed in Appendix I, paragraph I.5) should be assigned to the student to ensure that all aspects of the training programme are covered and to act as a mentor for the student. The training supervisor will also have at least 5 consecutive years' experience of aviation meteorological observing and preferably some experience of synoptic weather observing. The examination and/or report may be delegated to another member of the observing staff, if required.

F.8 Copies of the following publications should be held at the observing office for the use of trainees during training:

- Metform 716 Cloud Types for Observers
- Metform 796 Meteorological Observing Codes for use in METARs
- Metform 2612 METAR Register of Observations, or equivalent form for manually recording observations.

Training programme

F.9 The practical training will cover the following aspects:

- Manual observing techniques
- Observing during daylight
- Observing during darkness (including the transition between day / night)

F.10 During the practical training, continuous assessment shall be made of the trainee's ability to observe and correctly record the weather. The trainee

shall also undertake an oral examination during the course of the second week.

Assessment details during the practical training.

F.11 The assessment during the second week of training will entail a written paper on observing and coding, and oral questions. Part of the assessment will also involve a competency assessment of the student based on aspects of aviation observing.

F.12 At any point if the required standard is not being met, the student must be notified of deficiencies and of what standard is required. The student should also be encouraged to seek guidance from the mentor or member of the observing staff if they are concerned about meeting any competency.

F.13 To complete this course successfully the student must:

- Achieve a pass mark of at least 75% on the practical exam (consisting of at least 75% in the following aspects – 'Observing and use of instruments' & 'Oral Questions').
- Achieve a pass mark of at least 75% on the written exam.
- Pass all of the competencies and have them signed off by the end of the training.

F.14 Anyone who fails to complete ALL the competencies or if a pass mark is not attained in any of the examinations, will not receive accreditation.

F.15 Under some circumstances such as extremely benign weather or illness, it may not be possible to complete all competencies in the allocated time. In this case, assessment should be made by additional oral questions that explore weather scenarios that have not been met during the practical training.

Meteorological observers' competence-based document

F.16 A competence is a normal task completed in the course of making weather reports. Part of the routine duties of ATS personnel at airports will be to observe, code and transmit METAR reports.

F.17 In order to complete an observation successfully, a number of tasks must be carried out. This document sets out the standard that the student must achieve in each task. He or she must aim to reach this level of achievement during the practical training and maintain this standard through to the end of the course.

F.18 Problems may arise when assessing competence in certain aspects of weather observing if the weather situation remains constant through much of the assessment period. In this case, the comments box should be fully utilised by the examiner. Aspects such as overall theory knowledge may be taken into account.

F.19 Details regarding completion of the competency document and a copy of a form are reproduced as Annex A to this Appendix.

Operational competence

F.20 Following the award of the meteorological observing certificate the trainee observer should undertake a period of observing "on the job" under supervision (see Appendix I, Competency of Observers). This is to ensure that the observer is fully confident and capable of providing reports under operational conditions.

F.21 No observer will be immediately fully experienced in all types of weather conditions. For this reason, even when an observer starts operational observing without supervision, there may be occasions when some guidance is necessary from a more experienced observer when a weather event is encountered for the first time.

Continuous assessment

F.22 Every accredited observer should be assessed on an annual basis by the Manager, or other nominated person, of the Aerodrome Met Observing Service Provider to ensure the observer's ongoing competence (see Appendix I, Competency of Observers).

Annex A to Appendix F

Table 8: Observing competencies to be assessed during the practical simulations

Elements	Tasks	Criteria
Cloud (see note)	Recognise and name cloud types relevant to METAR reports	Correctly identify all cloud types observed relevant to METARs
	Estimate cloud amount, total and layers	Accurately estimate cloud amount in each layer ±1 okta
	Estimate cloud heights	Accurately estimate cloud height ±30% if not using the LCBR
	Encode cloud data	Correctly encode cloud data in the METAR register
Visibility	Estimate the visibility	Accurately estimate visibility using visibility points ±20%
	Encode visibility data	Correctly encode visibility data in the METAR register
Temperature	Read the various types of thermometers available	Accurately read **all** types of thermometers to ±0.1°C
	Encode temperature data	Correctly encode temperature data in the METAR register
Wind	Estimate mean wind speed and direction	Estimate wind speed to the nearest force on the Beaufort scale and estimate wind direction using 16 point compass, ±1 compass point
	Assess mean and gust wind speeds and direction from wind display systems including significant variations	Correctly obtain mean and extreme values from wind dials
	Encode wind data	Correctly encode wind data in the METAR register

Weather (see note)	Recognise and record the weather types and intensities that make up the Present and Recent weather codes used in observations	Identify variations in weather types, intensities and persistence. This will be checked using exercises and where possible observing simulations
	Encode weather data	Correctly encode weather data in the METAR register
Pressure	Read Precision Aneroid Barometers and apply instrument and pressure level corrections for QNH and QFE	Correctly read Precision Aneroid Barometers and apply instrument and pressure level corrections
Night observations	Demonstrate the ability to observe during hours of darkness	Estimate cloud detail, weather conditions and visibility to an acceptable level of accuracy
To complete all observations, and on time	To have all the routine observations coded up in METAR format on time	Ensure routine observations are completed within the specified time limits of: **T+50:** begin no earlier than &+40 and complete METAR by T+55 **T+20:** begin no earlier than T+10 and complete METAR by T+25
	To report and record all applicable special reports	Ensure specials are made when applicable without delay and record appropriately
	Demonstrate the ability to record and disseminate observations using local backup procedures	Maintain a suitable level of accuracy and regularity of observations using appropriate contingency observing equipment and procedures

NOTE: Clouds and weather – if little variety is seen during the week, overall theory knowledge on the subject may be taken into account for assessment purposes.

Appendix G

Training requirements for a Restricted Meteorological Observer's (RMO) certificate

Introduction

G.1 The training aims to provide tuition in the theory and practical skills required to make semi-automated weather reports to the standard necessary to ensure the safety of aircraft. On completion the trainee is awarded a restricted meteorological observing certificate. The certificate will only apply to observing duties where the Aerodrome Meteorological Observing Service Provider uses approved semi-automated systems.

G.2 Weather reports to ATS may be compiled using an approved semi-automated observing system but the dissemination of a METAR requires validation of the visual elements (visibility, present weather and cloud) before transmission.

Training programme

G.3 Training shall be carried out to enable the observer to visually evaluate the visibility, present weather, cloud amounts, height of cloud bases, and presence of significant convective clouds. This will allow either these parameters to be added to the weather report, or if sensors are available on the semi-automated system for recording these that they are validated before the weather report is disseminated.

G.4 The theory training should last two days followed by a period of supervised observing of at least three days.

G.5 Aerodrome weather reports may be compiled using an approved semi-automated observing system. This allows the non-visual elements to be generated from sensor measurements, and the visual elements to be assessed by a qualified observer. Training is necessary to enable the

observer to visually evaluate the visibility, present weather, cloud amounts/bases, and presence of significant convective clouds (TCU and CB) so that the sensor readings can be qualified.

G.6 The observer should be aware of the operational requirements for METAR reports at the aerodrome. At aerodromes where TRENDs are attached to the METAR reports, the observer should understand the procedures for obtaining the TREND message from the meteorological forecasting office.

G.7 The observer should understand the different requirements between weather reports provided for ATS and those disseminated beyond an aerodrome, in particular the METAR.

G.8 The observer should be able to interpret the self-briefing weather documentation available on an aerodrome.

Syllabus

G.9 The syllabus should cover the following aspects, in line with the requirements specified above:

- The METAR and introduction to ICAO Annex 3 Chapter 4.
- The purpose of the METAR to flight operations and forecasting.
- Differing requirements for surface wind reports ATC/METAR.
- Estimating visibility - differences between visibility reported in the METAR, slant visibility and when reported, RVR.
- Atmospheric conditions which result in reduced visibility.
- Observing present weather/recording past weather - limitations of sensors.
- Explanation of freezing precipitation and implications for observing.
- Association of precipitation with synoptic weather patterns.
- Identification of convective clouds.
- Operational significance of TCU/CB clouds.
- Estimating cloud amounts and cloud bases - limitation of sensors.
- CAVOK.
- Special reports and reports in the case of an aircraft incident.
- Procedures for attaching a TREND to a METAR.

- Supplementary groups on METAR reports.
- Self-briefing information.

Practical training for a restricted meteorological observer's certificate

G.10 Following the classroom instruction, a period of supervised observer training shall be arranged. At the completion of the training programme trainees shall be assessed by a written test, on successful completion of which they will be awarded a restricted meteorological observer's certificate. This will differ from the certificate awarded to those observers who attend the full standard training programme and will only apply to observing using semi-automated observing systems.

Operational competence

G.11 Following the award of the restricted meteorological observing certificate the trainee observer should undertake a period of observing "on the job" under supervision. This is to ensure that the observer is fully confident and capable of providing reports under all types of meteorological conditions.

G.12 No observer will be immediately fully experienced in all types of weather conditions. For this reason, even when an observer starts operational observing without supervision, there may be occasions when some guidance is necessary from a more experienced observer when a weather event is encountered for the first time.

Continuous assessment

G.13 Every accredited observer should be assessed on an annual basis by the Manager, or other nominated representative, of the Aerodrome Met Observing Service Provider to ensure the observer's ongoing competence (see Appendix I, Competency of Observers).

Relocation training

G.14 In the event that an observer is transferred from one ATS unit to another a short period of local familiarisation training shall be given before commencing unsupervised operational meteorological observing duties at the new unit.

Appendix H

Basic Meteorological Observer (BMO) competency

Introduction

H.1 ANSPs certificated by the CAA under Commission Implementing Regulation (EU) 2017/373 as an Air Navigation Service Provider to disseminate local MET reports at the aerodrome of origin are required to ensure that this information shall be provided by suitably competent personnel and taken from meteorological observing sensors with the specified level of accuracy.

H.2 Aerodromes that are not certificated as a MET Air Navigation Service Provider (ANSP) under Commission Implementing Regulation (EU) 2017/373 and have Instrument Approach Procedures without an Instrument Runway and/or Approach Control should ensure that MET information is provided by staff who have achieved a Basic Meteorological Observing competency, and which is taken from meteorological observing sensors with the specified level of accuracy.

H.3 A method to ensure that observing staff are aware of, and competent in, local observing and reporting procedures shall be established (see Chapter 2, Paras. 2.5 and 2.6)

H.4 The level of MET competency established should be proportionate to, and aligned with, the activities carried out at the aerodrome and the ANSP should assure itself that their staff can provide MET information which is suitable for aerodrome users.

H.5 This appendix provides guidance on MET competencies for observing personnel responsible for providing local MET reports, and guidance on maintaining observer competency.

H.6 The MET competencies set out below provide an example of a syllabus that could be used to establish a method for ensuring the competency of MET observing staff.

Syllabus

H.7 The following syllabus is intended to enable the observer to:

1. Provide an observation of cloud height and amount and differentiate between TCU and CB.
2. Distinguish between different present weather phenomena.
3. Observe and report visibility.
4. Provide wind, temperature and pressure information, apply instrument and pressure level corrections and, in the event of instrument failure use contingency instrumentation as necessary.
5. Observe to an acceptable level at night.
6. Record observations as necessary.
7. Have a knowledge of basic meteorology (air masses, weather fronts etc.).
8. Have a basic knowledge of Met information (TAF, METAR, weather warnings, aviation briefing charts etc.).

Syllabus guidance

H.8 Additional guidance regarding the syllabus and its content is given below:

1. Course length: This should be sufficient to cover all the areas listed in H.7 above.
2. On completion of the syllabus established by the ANSP, the Met Observer should be able to demonstrate the following competencies:

3. METAR code: A basic knowledge of the METAR code which should include widely used terms such as CAVOK, FEW, SCT, BKN, OVC etc.

4. Visibility: Be able to report prevailing visibility in the recognised coded format, e.g. 4000 metres, 7 kilometres. Awareness and reporting of phenomena, e.g. fog patches, that create significantly different visibilities in other parts of the aerodrome is also desirable.

5. Atmospheric pressure: Be able to report both QFE and QNH pressure values is required.

6. Surface wind: Be able to report wind direction, mean speed and gust speed from instruments and from contingency equipment.

7. Night-time observing: Be aware of the methods to employ when observing at night, the differences that are likely to be encountered and how these can be overcome.

8. Met Equipment: A basic knowledge of all the Met equipment they use. This includes:
   a) An understanding of the basic functions of the equipment they use
   b) A knowledge of how to read the output from the equipment.
   c) A knowledge of where the equipment manuals and user guides are kept and where basic fault finding information can be obtained.

9. Radio messages: When passing weather information to pilots it is recommended that the information be consistently sent in a standard order as detailed in CAP 413 ‘Radiotelephony Manual’.

10. Observation Report Form: Use of a standard observation report form is not required.

Competency Assessment

H.9 Staff that have achieved a basic level of Meteorological Observing competency should be able to demonstrate continued competence in providing Met observations. This may be achieved through regular checks, questions and assessments.

H.10 As a minimum, Met Observers should be assessed on an annual basis by the Manager, or other nominated person, of the Aerodrome or Aerodrome Met Observing Service Provider to ensure the observer's ongoing competence (see Appendix I, Competency of Observers).

Appendix I

Competency of Observers

I.1 The observer shall be required to demonstrate competence in all aspects of meteorological observing under normal working conditions.

1.2 Table 9 shows all the competencies that an observer may be required to demonstrate. The specific competencies required will be dependent on whether the Observer is accredited (Aerodrome Met Observer (AMO/Full) or Restricted Met Observer (RMO), or not accredited (but have achieved a basic level of Meteorological Observing (BMO) competency). Competencies are also dependent on the aerodrome, type of meteorological observing equipment used and level of instrument equipage.

I.3 In particular, consideration shall be given to the observing and coding and any supplementary information required to be provided with relatively rare weather events, such as thunderstorms or snow, as well as observing backup procedures.

1.4 Table 10 provides additional areas that it may be desirable for observers to have knowledge or awareness of; however, this does not form part of the competence assessment.

I.5 All Met observers should be assessed on an annual basis by the Manager, or other nominated person, of the Aerodrome or Aerodrome Met Observing Service Provider to ensure the observer’s ongoing competence.

1.6 A record of Met observer competency checks shall be kept for a minimum of 12 months including the date that the check was carried out.

Table 9: Meteorological observing competencies

Element	Tasks	Competence assessment	Level of competence
Wind	Assess mean, extreme and significant variations in mean wind speeds and direction from wind display systems. Assess mean and extreme wind speeds and direction from wind display systems.	Correctly obtain mean, extreme wind speed and significant variations in mean wind speeds and direction as required. Correctly read and report mean and extreme wind speeds and direction values as required.	AMO, RMO BMO
	Provide correct wind data as part of the METAR.	Correctly encode wind data as required	AMO
Visibility	Estimate the visibility Estimate the visibility together with visibility sensors.	Correctly use visibility points. Correctly encode visibility using visibility points.	AMO, RMO, BMO AMO, RMO
	Provide correct visibility data as part of the METAR.	Correctly encode visibility data as required.	AMO
Runway visual range	Obtain runway visual range from either human observed RVR conversion tables or using IRVR system.	Correctly obtain runway visual range information as required.	AMO
	Provide correct RVR data as part of the METAR.	Correctly encode runway visual data as required	AMO

Weather	Recognise and report present weather types and intensities.	Correctly identify variations in weather types and intensities.	AMO, RMO, BMO
	Recognise and record the weather types and intensities that make up the Present and Recent weather codes used in advance.	Correctly identify variations in weather types, intensities and persistence. This may be checked using exercises and observing simulations.	AMO, RMO
	Provide correct weather data as part of the METAR.	Correctly encode weather data required.	AMO
Cloud	Recognise and name cloud types relevant to METAR reports	Correctly identify all cloud types observed relevant to METARs.	AMO, RMO
	Recognise and know the difference between TCU and CB cloud types.	Correctly identify and report TCU and CB clouds as distinct from all other cloud types.	BMO
	Estimate cloud amount, total and layers.	Estimate cloud amount in each layer ±1 okta	AMO, RMO
	Estimate cloud amount total and layers.	Estimate cloud amount FEW, SCT, BKN, OVC.	AMO, RMO, BMO
	Estimate cloud heights.	Estimate cloud height to within ±30%.	AMO, RMO
	Estimate cloud heights.	Estimate cloud height with reference to local terrain.	AMO, RMO, BMO

	Encode cloud data.	Correctly encode cloud data as required.	AMO
Temperature	Read the various types of thermometers available.	Accurately read thermometry to ±0.1°C.	AMO, RMO, BMO
	Encode temperature data.	Correctly encode temperature data as required.	AMO
Pressure	Read pressure sensors and apply instrument and pressure level corrections for QNH and QFE.	Correctly read pressure sensors and apply instrument and pressure level corrections as required.	AMO, RMO, BMO
Night observations	Demonstrate the ability to observe during hours of darkness.	Estimate cloud detail, weather conditions and visibility to an acceptable level of accuracy.	AMO, RMO, BMO
To complete all observations, and on time	To have all the routine observations coded up in METAR format on time.	Ensure routine observations are completed within the specified time limits of: **T+50:** begin no earlier than +40 and complete METAR by T+55 **T+20:** begin no earlier than T+10 and complete METAR by T+25.	AMO, RMO
Contingency equipment and back up procedures	To report and record all applicable special reports.	Ensure specials are made and reported correctly when applicable without delay and are recorded appropriately.	AMO, RMO
	To record and disseminate observations using appropriate contingency	Maintain a suitable level of accuracy and regularity of observations using	AMO, RMO, BMO

	observing equipment local backup procedures.	appropriate contingency observing equipment and local back up procedures	

Table 10: Desirable additional areas of awareness and knowledge for the observer

Area	Detail	Level of competence
Knowledge of definitions	Observation, aeronautical meteorological report, visibility (prevailing and minimum), runway visual ranges, altitude, height, aerodrome elevation, landing forecast (trend), aerodrome forecast, SIGMET.	AMO, RMO, BMO
Meteorological observing systems	Limitations of sensors and algorithms used to determine the 'visual' elements of visibility, present weather, cloud amount and cloud base height.	AMO, RMO
Dissemination of weather information	Knowledge of procedures for dissemination of weather information at the aerodrome. Elementary understanding of the general organisation of aeronautical telecommunications.	AMO, RMO
Supplementary information provided in METAR and local reports	Runway state report, aircraft icing and turbulence, wind shear.	AMO, RMO
Meteorological aspects of flight planning	Meteorological basis for pressure-pattern flying, weather and aerodrome forecasts; interpretation of area, route and terminal forecasts.	AMO, RMO, BMO
ATS	Familiarity with special requirements relating to Category II and III operations particularly in respect of runway visual range, cloud base information, and any other specific local requirements by aeronautical users for meteorological information.	AMO, RMO

Operation of aircraft	Flight planning, altimeter setting procedures, standard atmosphere, effects of various weather phenomena on aeronautical operations and on aerodrome ground services.	AMO, RMO

Appendix J

Calibration requirements for wind and pressure measuring equipment

Wind measuring equipment

Analogue cup or vane systems

J.1 Calibration of analogue cup or vane anemometers must be carried out in a wind tunnel. Every anemometer in use on the aerodrome whether for use solely for ATS purposes or use in Met reports must be calibrated at a minimum of every 2 years. It should be noted that if operational experience indicates a need, the calibration should be carried out more frequently.

J.2 It is recommended that while the cup or vane system is being calibrated it is serviced in order that the bearings and other moving parts are replaced. This prevents the system from seizing up or providing inaccurate wind readings due to the cup or vane system requiring a greater starting speed before providing a valid wind speed reading. Each cup or vane system should have a calibration certificate that details the cup and vane sensor serial number(s), the date of calibration, the company or organisation that carried out the calibration and the calibration source (detailing the standard to which it is traceable).

Digital cup or vane systems

J.3 Servicing of digital cup or vane anemometers should be carried out on an annual basis. Where the sensors are refurbished to an as new condition as part of the service, wind tunnel calibration is not required; otherwise calibration in a wind tunnel is required at least every 2 years.

NOTE: Sensors serviced using manufacturers' replacement parts would be considered to have been refurbished to an as new condition. If manufacturers' replacement parts are not used calibration in a wind tunnel is required.

All cup or vane systems

J.4 Where cup or vane systems are stored as a replacement for those systems undergoing calibration these should also have been calibrated no more than 3 years previously before use.

J.5 Where required, maintenance checks may be carried out on each cup and vane anemometer system in use, these checks should include ensuring that the vane direction system is aligned with magnetic north by ±3 degrees. It should be noted that the requirement for the actual reporting of the wind direction is ± 10 degrees.

J.6 Where a comparison is made with a hand held anemometer this should only be used to indicate that the instrument is functioning correctly, it should not be considered a calibration.

Ultrasonic wind sensors

J.7 Ultrasonic wind sensors should be calibrated in accordance with the manufacturer's recommendation. It should be noted that as these systems do not use bearings or have moving parts and consequently do not need as frequent maintenance as the cup and vane systems. Therefore recalibration in a wind tunnel is not usually required. During any maintenance inspection a speed zero check and an alignment check of all the vertical transducers should be performed. An orientation check should also be carried out to ensure the sensor is aligned with magnetic north by ±3 degrees.

J.8 For each anemometer and wind vane (direction sensor) a record should be kept which details the serial number(s) and date of installation as well as the location on the aerodrome.

Pressure measuring equipment

J.9 All pressure sensors that are used at an aerodrome as primary or as contingency devices are required to be calibrated on an annual basis.

J.10 The calibration should be against traceable national or international standards. It should be noted that where a pressure sensing device consists of 2 or more pressure sensors these individual sensors are required to be calibrated in order to ensure the corrections used within the device are accurate.

J.11 The calibration should ensure that a range of pressure values are tested, these should be between 900 hPa and 1050 hPa, it is recommended that as a minimum 5 values are used. Any difference between the barometer under test and the check barometer should be less than ±0.5 hPa. Therefore the barometer that is used as the checking device should have an accuracy greater than ±0.2 hPa.

J.12 The calibration certificate should detail the barometer's serial number, the date of calibration, the company or organisation that carried out the calibration and the calibration source (detailing the standard to which it is traceable). It should also provide a copy of the calibration report that shows the pressure values that were tested and the resulting values from the barometer being calibrated.